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MARRIAGE AND GENETICS

LAWS OF HUMAN BREEDING
AND
APPLIED EUGENICS

By

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PREFACE

This book is from the pen of a surgeon, one whose daily life is largely engaged in dealing, professionally, with conditions that affect the power of the human race to perpetuate itself.

It was first conceived as a message from the operating room, a danger signal or a series of danger signals from the hospital ward, a revelation from the council chamber—that great and sacred confessional of the medical profession.

The motive prompting the effort was a desire in some measure to overcome the ignorance which, in too many instances, keeps innocent victims from protecting themselves and their offspring from disease and degeneracy. An incidental object was and is to avert many of those conditions that destroy the possible happiness of the married state and convert the bridal chamber into the anteroom of the divorce court.

This broadened purpose made it necessary to consider the laws, the natural laws of human breeding inherent in the individual, as the very foundation of my thesis. We are constantly hearing of these laws, but their text is rarely, if ever, given and their application is but rarely explained in terms comprehensible to the reader not

versed in the technical phraseology of the biologic sciences.

It has thus come about that I have tried to prepare a brief comprehensive and comprehensible statement of the ten fundamental laws of race perpetuation—the Decalogue of Human Breeding.

To these laws and to short explanations of their significance, I have added a brief description of the two diseases, incidents of vice, that are to-day poisoning the race. Knowledge is the best preventative of disaster. When the innocent victims of marital duplicity shall know, as I here endeavor to teach them to know, the nature and significance of the maladies that have been inflicted upon them, they will better know how to protect their rights, physical, moral and legal, and to punish the authors of their misfortunes.

The concluding section on "Applied Eugenics" represents an endeavor to translate the abstract into the concrete, to convert words into action. It is a brief summary alphabetically arranged, of genetic factors, of conditions and forces that fall within the purview of the immutable laws underlying selective breeding in the human family. The knowledge embraced under this heading has long been known to the medical profession, from whose arcana of science it is here given forth for the guidance of the people.

I have endeavored to discuss these questions with all delicacy compatible with a statement of the truth as I have been forced to see it. The use of phrases to obscure meaning would be not only im-

modest, but destructive of the exalted purpose for which the book is written, and is therefore not attempted.

The topics are of vital importance to every prospective husband and wife and to their unborn children. No parent can fully discharge his or her duty without taking full cognizance of the truths that are here set forth. I therefore offer no apology for sending out a message, a proper consideration of which will, I am convinced, inure to the welfare of the people now living and of coming generations.

INTRODUCTION

"Falling in Love."

The mating of a young man with a young woman to-day in various Occidental countries generally begins by "falling in love." Those of us who have experienced the thrills of that halcyon epoch would scarcely care to deny similar joys to those who may follow us. Nor is there much prospect of a change in the sentimental attitude of the sexes toward each other. The music and poetry of all ages, the daring and chivalry of men, the sacrifice and martyrdom of women, the achievements of ambition, the destinies of nations and the welfare of races have been and rightly shall continue to be actuated by the sentiment of love—the love of a man and a woman, each for the other. It is the same love that Millet pictured in the "Angelus," where, with the implements of toil laid aside, in the open field at the close of day, with neither wealth to bribe nor ambition to allure, a young man and a young woman with clasped hands and bowed heads stand consecrated each to the other at the unseen altar of affection. It is the same honest love that sheds its joys and its sunshine alike where poverty abides and where opulence revels.

But, approve of "falling in love" as we may, we must examine it in all of its phases to determine approximately why and how it plays such a large part in the affairs of mankind.

What, then, is meant by "falling in love?" First and foremost, it is a manifestation of sex attraction —a drawing together of a man and a woman in response to the fundamental natural law underlying the very existence of the race. But why does each of these particular two persons attract the other? Probably, if asked, neither could put the answer into words. The first unconscious reason is to be found in proximity. If we care to speak of sex attraction in terms of physical law, we may say that it, somewhat like the law of gravitation, is effective inversely to the distance.

But, having met, having seen each other once or repeatedly, certain qualities are discerned that make each of the two attractive to the other. The man is perhaps strong physically or mentally, or both, able to cope with the world, to make a living, to build a home and to protect a wife and children; or, possibly, he is physically weak, mentally not strong, may be the victim of disease, all of which excites sympathy, and sympathy is akin to love. Or, on the other hand, the woman has beauty, grace or culture, or all three; she is amiable and docile, or has "spirit and dash;" or she dresses well and has social charm. Secondary considerations, such as wealth and social position, may enter into the attraction on both sides. This is a fair outline of

the basis of appeal, and it must be allowed that all of these considerations are important and ought never, consciously or unconsciously, to be ignored. But as a basis of appeal for a life association that shall determine the happiness and welfare not only of the contracting parties but of their children, these attributes and considerations are defective in at least one important particular, and that is that neither of the two persons first influenced by it has taken into consideration, consciously, at least, the qualifications of the other for the sacred office of parenthood. We would have the "falling in love" go on as ever before, but we would have the motive underlying it broadened, strengthened, exalted by a frank and intelligent understanding of this vital phase of the question.

COURTSHIP.

Courtship is generally that period of more or less irrational existence intervening between the act of falling in love and getting married, instead of being, as it might better be, the period between first acquaintance and the irresistible dominance of affectional impulse. Courtship is rightly the period of pleasure, but pleasure in this instance should have some other meaning than mere frivolous association, or social dissipation. It has been facetiously defined as the period during which two young people try to keep the truth from each other, and, in the germ of fact underlying this jest, is to be

found many a seed of future discord. There is a deep meaning underlying courtship. It is the process of ascertaining characteristics and adjusting differences with reference to establishing harmonies which must underlie any happiness that may be derived from the life that, in the event of marriage, is to be lived in common. This being true, it follows that every phase of the important question should receive consideration. Physique, health, habits, tastes and tendencies, even now generally come under more or less subconscious consideration. Fortunes, prospects, purposes and ambitions are liable to have some attention. But the most important of all facts, under stress of popular but mistaken convention, are generally kept in the background. The heritage of deeds and stocks and bonds locked in a safety deposit drawer, is of unquestioned importance. But "deeds" done, possible diseases and vices, or, more happily, high efficiencies and honorable ambitions, all hidden away "in the blood," comprise an inheritance vastly greater in significance. This is the particular kind of "fortune" concerning which, with the generality of people, until latterly it would have been considered offensive to ask and presumptuous to tender information.

It is precisely against this phase of conventional courtship that the campaign is being waged for a recognition and a timely recognition of the law of heredity, as one but not the only logical basis of eugenic marriage. And, fortunately, in this par-

ticular, a change is already apparent in social usages. The subject of marriage, especially in its relation to the great problem of heredity, may now, upon proper occasions, be discussed in the drawing room without violence to "good form." The family newspapers and the magazines discuss the question without reserve. The school teacher and the minister of the gospel are within the pale of propriety, when they consider it in their respective stations. Clubs are formed, books are printed and lectures are delivered on this subject, all with not only the approval but the patronage of good society.

MARRIAGE.

With all this active attention to the subject, it is important at the very outset to know just what is here meant, first, by "marriage" and, next, by "eugenic" as applied to marriage .

Let it be understood, therefore, that "marriage" as here used means the ordinance that society has established to govern the presumably permanent mating of one man and one woman for the orderly and responsible perpetuation of their species.

"Eugenic," as the origin of the word implies, means "well born" and, as applied to marriage, signifies the union of one man with one woman as husband and wife, not merely for the perpetuation of the species without reference to quality, but for the production of the best possible progeny.

This form of sexual mating, viewed from the cold standpoint of science, has the reproductive impulse as its first and deepest, although often subconscious motive. The protection of the mother and children, the dependent members of the family, and the protection of society itself from the burden of maintaining these dependents are the reasons why society has established monogamic marriage as against plural or polygamous marriages, and has surrounded it with safeguards of both convention and law. And here society, taken as we find it, seems to have lost interest in the proceedings. At any rate, until recently, neither sentiment, convention or law has been framed to regulate in the slightest degree the quality of the very fruits of marriage against the burdens of which society has sought to safeguard itself. In other words, society, by establishing the religious and civil institution of marriage, has sought to protect itself against the burden of maintaining mothers and infants during their periods of helplessness, but has deliberately shut its eyes to the greater burdens it is daily assuming through merely instinctive matings and the consequent production of offspring unfit to maintain themselves in the struggle for existence.

THE PERSONAL PHASE.

But the problem is always first a personal one. It must involve individuals before it can involve the race. It is, therefore, the individual to whom

the appeal is made and who must first appreciate the real significance of marriage, monogamic marriage, in its relation to his or her happiness and well-being before a beginning can be made in the change of general social conditions. It is only when the whole question can be considered in its personal, rather than in its broader social relations, that it becomes a theme that is freighted with real human interest; an interest that has to do with tears, laughter, pulse-beats, heart-throbs, disease, sorrow and early death; or, on the other hand, with health, efficiency, happiness and fullness of years.

A theme that thus deals with the deepest sentiment and the profoundest welfare of the human individual and with the family considered as the unit of society, here and now as well as in the future, must be approached in full appreciation of ascertained facts and be discussed in the light of natural laws underlying the problem.

THE PROBLEM.

The problem, viewed from the standpoint of the youth of to-day, the prospective parents of the immediate future, is to spare him or her the unhappiness derivable from uncongenial, vicious or otherwise "unfit" companionship, and from the burden and humiliation of an unworthy or even degenerate progeny. Viewed from the standpoint of society or of the nation, the problem is somewhat to mitigate the burden of inefficiency, vice, degen-

eracy and crime, that to-day occasion the chief expense of governments and the chief menace to the progress of the race. The magnitude of the burden and the gravity of the problem may be accentuated by a few illustrative facts, first of an individual, and next, of a national or racial character.

(a) The Individual Problem.

The first illustration is found in the contrasting histories of two families whose records are made to do duty in practically every work on eugenics written from the American standpoint,—records, however, which have been and can still farther be paralleled by instances of similar significance.

In the early half of the eighteenth century, a hard drinker, living among forest-clad hills of Northern New York, became the original progenitor of a notorious family known to history under the fictitious name of "Jukes."[1] By the end of the nineteenth century, the known descendants of this man numbered twelve hundred persons. Of these, over three hundred received pauper support, equivalent to twenty-three hundred years of pauper support to one person; one hundred and forty were criminal offenders and there were two hundred and fifty arrests and trials; sixty were habitual thieves; seven were murderers; fifty were prostitutes; forty

[1] "The Jukes," a Study of Crime, Pauperism, Disease and Heredity. By R. L. Dugdale. New York, G. P. Putnam's Sons, 1877.

of the women were known to have had syphilis and estimated to have syphilized over four hundred men, forty of whom, in turn, syphilized their own wives; the progeny thus tainted is unknown; thirty were prosecuted for bastardy. Of a total of only twenty who acquired useful trades, ten learned them in state's prison where terms aggregating one hundred and forty years for one person had been passed. The aggregate cost of this family to the state was known to have been $1,308,000.00. What the roll of crime and aggregate of cost would be after the forty-three years since Dugdale's investition staggers the imagination, *for, be it remembered, these diverse streams of contaminated germplasm are to-day flowing on through the generations without let or hindrance from society or the state.* It is small wonder that Dugdale concluded his classic investigation with the observation: "It is getting time to ask, do our courts, our laws, our alms-houses and our jails deal with the question presented?"[2]

In the contrasting case, we have distinctly to deal with the progeny of a woman—Elizabeth Tuttle, a woman with the stamp of physical and mental superiority,—who, in 1667, married a Connecticut lawyer by the name of Richard Edwards. Among her descendants there have been more than three hundred college graduates; fourteen college presidents; more than one hundred college professors;

[2] *Ibid*, p. 70.

thirty judges; sixty physicians; over one hundred clergymen, missionaries and theological professors; sixty-five authors of 135 books; numerous editors, and a large number of leaders of industries. This progeny is accredited to Elizabeth Tuttle, because her husband, Richard Edwards, married as a second wife, Mary Talcott, "a mediocre woman, average in talent and character, and ordinary in appearance," by whom he had five sons and a daughter. It is recorded that "none of Mary Talcott's progeny rose above mediocrity and their descendents gained no abiding reputation."[1]

The personal problem presented by eugenics is for each person to see to it that, by due regard to the laws of human breeding, his or her progeny shall belong to the "Elizabeth Tuttle" stamp rather than to the "Jukes" stamp.

(b) The Race Problem.

While the problem of practical eugenics is in every instance primarily personal, involving the sexual relationship of one man and one woman, we see, from the two examples just quoted, that the results spread in a widening circle until, starting from thousands of centers, they successively coalesce and speedily become of deepest concern to the home, the community, the nation and the race. The depth of this concern is not to be measured so much

[1] "Heredity in Relation to Eugenics." C. B. Davenport, p. 226.

by statistics as by tears and sorrows in afflicted homes and by the great chorus of groans and curses from the diseased and degenerate,—the great army of the unfit,—that is daily being ground to death under the remorseless Juggernaut of natural selection.

If we would get a more concrete conception of this phase of the problem let us remember that every individual is made up of a bundle of character units, each of which and to a certain extent without reference to the others, is susceptible of transmission to offspring in accordance with certain now definitely determined laws of human *genetics* or all the laws, good and bad, concerned in human breeding. It should be remembered, too, that these transmissible character units are made up of two classes, namely, (1) those that tend to deteriorate or destroy the race and that I call *agenic* units; and (2) those that tend to improve the race, and that, in accordance with the term invented by Sir Francis Galton, I call *eugenic* units.

This distinction, which is fundamental, becomes apparent when we enumerate some units of both classes.

Among the agenic character units—those that operate against the welfare of the race and that are transmissible from one generation to another—may be mentioned defective physique, feeble-mindedness, epilepsy, insanity, pauperism, alcoholism and drug habituation, syphilis, criminality, certain nervous diseases, defects of speech, including deaf-mutism,

together with numerous other organic and functional defects. The fruit of contamination with these strains is found not only in the deterioration of previously wholesome families, but in the actually accelerated degeneracy of those previously tainted. The grist may be found in the thousands upon thousands of defectives known not only in the homes they severally curse with their existence, but in the other thousands upon thousands that are segregated in penitentiaries, reformatories, asylums for the insane, institutions for feeble-minded, hospitals for epileptics, homes for the blind and for deaf mutes, alms-houses, county jails and work-houses, the maintenance of all of which constitutes one of the chief burdens of government.

Among the eugenic character units—those promotive of the welfare of the race and that are transmissible from one generation to another—may be mentioned strong physique, including weight and stature; mental ability; aptitudes for music, art, literary composition and mechanical skill; memory; morality and temperament. The blending and consequent dominance of these traits necessarily redounds to the strengthening and wholesome evolution of every family strain that is thus fortified. The ripened harvest is to be found in schools, colleges, universities and churches, in institutions devoted to science, art and religion; in executive offices and legislative halls, in honest labor and in the no less honest upbuilding and management of enterprise, at once colossal and beneficient; and,

finally, in the highest function that man may exercise, the establishment of happy homes and the rearing of well-bred families.

The race problem presented by eugenics is, therefore, by observance of the laws of human breeding, and by other measures available to society, to repress, if not to eliminate, hereditary strains that tend to degeneracy, and to effect as far as possible the dominance of hereditary strains that tend to human betterment.

THE SOLUTION.

The solution of the problem of race culture is to be found in the education of the people to the effect that, in human breeding as in all other natural processes, like causes produce like effects under like circumstances. They must be taught to appreciate "causes" and "effects" and "circumstances," as the words are here employed. To do this, they must be put in possession of information that has been and is being laboriously compiled by careful and painstaking scientists,—information upon which natural laws have been and are being formulated. They must be given these natural laws themselves in plain words. Then must follow the translation of words into things,—of laws into action.

But how is all this to be arrived at? The beginning will only be made when the people shall begin, as many of them have already begun, seriously to consider the question, to read about it, think about

it, but more especially, to talk about it. There is no process that so enlarges intelligence and determines conduct as conversation between enquiring minds. The first and most important question for each person to ask and answer is: "What of me and my family?" And the next, almost equally important, is: "What of my neighbor and his family?" If now the two can get together and talk it over, not necessarily so much in its personal as in its scientific aspects, much and rapid progress will be realized. Or, if even a larger group of friends and neighbors could meet for home study of the great question as it relates to the individual, the state, the nation and the race, the whole movement would thereby be accelerated. Sooner or later public opinion always determines public action.

It is precisely to meet this indication that the Galton League [1] has been formed. It consists of

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[1] *The Galton League for the Study and Promotion of Eugenics* is an international movement that has among its declared purposes the following:—

(1) The personal study and practice of eugenics.
(2) The dissemination of knowledge relating to race culture.
(3) The promotion of investigation by the state, relative to hereditary factors in criminals, defectives and dependants.
(4) The protection of society against the unrestrained hereditary transmission of certain known forms of degeneracy.
(5) The safeguarding of marriage against transmissible disease and genetic fraud.
(6) The recognition of genetic principles in popular educational methods.
(7) The promotion of social customs and legislative enactments to carry these purposes into effect.

Full particulars may be had by addressing,
THE GALTON LEAGUE, Cincinnati, Ohio, U. S. A.

persons all over the country who are interested in race betterment. In many communities, small local groups are formed to talk over the question in all of its phases. A systematic course of easy reading covering a year, serves to form a solid foundation for intelligent action. The questions considered relate, first, to the present-day welfare and happiness of the individual, and next, to the worth, honor and station of those who are to carry not only that individual's name, but his or her germplasm, his or her very self, through future generations. Then come such topics as the proper protection of the unfit and the proper protection of society against the burden imposed upon it by the rapidly increasing army of the unfit. Here the theme merges into sociology, economics and ethics. But the beginning point is in an understanding of the natural laws, plainly stated, underlying the whole question. These laws I have endeavored to codify and present in the following chapters on "Marriage and Genetics."

DIVISION I.

General Laws of Genetics

CHAPTER I.

LIFE.

If marriage is an ordinance for the orderly and responsible perpetuation of human life, it is important that we should have a few fundamental ideas, not only about human life, but about life in its general manifestations.

Let us then say that life is the greatest thing in the universe, for without life, the universe would be inconceivable. It is by life that we ourselves can discern life. It exists in myriad forms. We see it in the lowly but important organisms, a million of which, ranged in single file, measure less than an inch; we contemplate it in the majestic redwood with its roots grounded in the valley and its topmost boughs piercing the clouds; it is manifested in the jellylike speck of protoplasm, in beasts of the jungle, in the kings of the forest and in the mighty leviathans of the deep; it exists in insect, reptile, beast and bird; and, finally, we wonderingly behold it in its most exalted manifestation in the human species. The pages of history and the annals of science deal with life—life everywhere and always—life that was and is and shall be—life, the most dominant and persistent of all phenomena.

This something we call life is not definable. We may, however, speak of it as the play of forces manifested in organic existence, or as the individual

manifestation of existence. For our present purpose, we may accept either one of these conceptions or reject both of them, leaving the term "life" to everybody's unexpressed understanding of its meaning. It is sufficient for our object to recognize, first, that life is always manifested in some individual form of existence and, second, that living individuals, of whatever form, singly or in pairs, have the inherent power, under normal conditions, to perpetuate life, each by the perpetuation or reproduction of its own species.

The methods by which life is perpetuated differ with the different orders of existence. The little cell of which I spoke breaks into two; each of these halves develops into a cell which divides into two others, and so on indefinitely. The oak drops its seed, the acorn, upon the earth, where it becomes covered, sprouts and grows into another oak; the flowering plant has in the constituents of its blossoms the creative elements which, when co-existent, produce the seed from which the new plant grows; the female fish deposits her eggs, each of which, when fertilized by the male fish, may develop into a new fish; the bird lays an egg which, if previously fertilized by the male, and kept at a proper temperature for a proper length of time, hatches into a new bird; the female animal develops within her organism a microscopic egg which, if properly fertilized by the male, goes through a period of development within her body, after which it is brought forth as a new individual of the same species. This

latter process characterizes reproduction in the human species.

From this mere glance, first at the manifestations of life and, next at the processes of reproduction in the various forms of life, several important facts become apparent. The first is that, in the lowest orders of life, such as the microbes, reproduction takes place by mere division and without the functions of sex, which does not exist in these species. The next is that there are certain orders of existence in which both sexes exist in the same individual. The third fact is that, in all higher orders of animal life, including the human family, the sexes, male and female, concerned in the function of reproduction, exist respectively in different individuals.

We see from this brief survey of life that it is definitely conditioned in its forms of manifestation and that we are justified in making the following important generalizations which, indeed, have the force and effect of what we may designate

THE LAWS OF THE MANIFESTATION AND PERPETUATION OF LIFE.

(1) *Life is always manifested in some individual form of existence.*

(2) *Each living individual has, in whole or in part, the inherent ability under normal conditions to perpetuate life by the continuation through reproduction of that individual's own species.*

(3) *Life may be continued through reproduction by (a) organisms that have no sex, (b) organisms that have both the sexual reproductive elements in the same individual, and (c) organisms that have the sexual or reproductive elements in two different individuals—male and female.*

(4) *The continuation of life through whatever manner of reproduction it may be effected is always an orderly process governed by definite natural laws.*

APPLICATION OF THE LAWS OF MANIFESTATION AND CONTINUATION OF LIFE.

These four laws express knowledge that is so widespread that they may seem mere commonplace. They, however, are of extreme importance when considered as the foundation of everything that is to follow relative to race culture and race regeneration. It is especially important to grasp the fundamental importance of the final paragraph to the effect that all reproduction is orderly and subject to natural law. When I speak of law in this connection, I of course allude to biologic law and not to statutes and conventions. These laws of reproduction are always special adaptations of the broader law of cause and effect,—the law which declares that like causes produce like effects under like circumstances. This law holds good whatever may be the product of reproduction, for natural law has just as much

to do with the production of bad results as with the production of good results. It follows, therefore, that if mankind is true to its heritage, it will so enlarge its intelligence as to comprehend the laws of its destiny and conform to those which make for its increasing well-being.

CHAPTER II.

THE CONTINUITY OF HUMAN LIFE.

The idea set forth in the last chapter that life is continuous demands some further explanation. This demand arises from the fact that the words "continuation" and "continuity," as applied to life, are used designedly to imply that *life is actually perpetuated or passed on without break from one generation to another*, as distinguished from the popular and mistaken notion that it is the function of one generation actually to create life anew in the next generation. This fact, one of the latest and most important of modern science, was discovered by Weismann in 1892.[1]

To understand this great generalization a little more clearly, it is sufficient to bear in mind that, aside from some distinctly chemical elements, the entire human body is made up of small microscopic particles called cells. These cells are divided into two classes, namely:

(1) The great mass of cells that make up the whole appreciable bulk of the human body and which, for that reason, are spoken of as body cells, or somatic cells, and are derived from the jelly-like substance called bodyplasm or somatoplasm.

(2) A comparatively small mass of cells that bear no appreciable relation to the bulk of the

[1] A. Weismann, "The Germ Plasm, a Theory of Heredity." New York Edition, 1912.

human body, but whose sole function is the transmission of life to the next generation, for which reason they are called *germ cells*, and are derived from the soft jelly-like substance called the germplasm.

I wish especially to call attention to this *germplasm*.

In human beings, it exists in both the male and the female. A germ cell derived from the germplasm of the female and another derived from the germplasm of the male must be brought together to create, not a new life, as we shall see, but a new body in which the germplasm, the original germplasm derived from both parents, continues to exist as germplasm.

This brings us to the next important distinction, namely, that between (1) life, germinal life, and (2) conscious existence.

(1) If life is carried by the germplasm, it must exist in the germplasm. If the germplasm does not perish, but passes on through generations, it follows that life, which is in the germplasm, does not perish but passes on through the generations. In this physically demonstrated fact, we arrive at the scientifically enforced conclusion that life, human life, freighted with all the attributes of the race, especially those of direct ancestral origin, is continuous.

(2) We know that life, as it exists in that microscopic part of germplasm known as the germ cell, al-

though carrying all the potentialities of the race,[2] lacks the element of consciousness. Memory has never bridged the chasm between the generations. But the life that is in the two germ cells, male and female, when coalesced, has the power to build up around it the body of the new individual, which ultimately, as infant, child and adult, develops the attribute of consciousness. It is this body that is often erroneously spoken of as "a new life," when, as a matter of fact, it is but a manifestation of conscious existence by means of which the cumulative life of preceding generations is safeguarded for a time to be handed on by the same individual to the next generation. The essential distinction is, therefore, that while germinal life is continuous and consequently in this sense immortal, the conscious existence which characterizes its manifestation in the individual has a definite term that extends from the birth to the death of the body.

This conception of the continuity of life has its foundation in what is now universally recognized as

WEISMANN'S LAW OF THE CONTINUITY OF THE GERMPLASM.[3]

(1) *The fecundative elements derived from and consisting of the parental germplasms, male and*

[2] *Voir* Law, p. 29.

[3] "The Germ Plasm," p. 183. Note.—It is not within the purposes of this work to present the biologic basis of Weismann's Theory beyond the existence of "determinants," as it

female, unite with each other, and perpetuate themselves as germplasm in the new individual.

(2) It thus occurs that the germplasm, the identical germplasm of each parent, exists in united form, but still as the same germplasm, in the offspring by whom, in turn, it is elaborated without changing its united but not blended qualities, and is then transmitted in the same way to the next generation and so on through succeeding generations.

APPLICATION OF WEISMANN'S LAW OF CONTINUITY OF THE GERMPLASM.

The discovery of this law with the demonstration of its validity in explaining the phenomena of human life has marked a new epoch in social evolution. The fact made understandable, first by Weismann, that life is continuous, and, second, by Haeckel, that the germ cell is the epitome of racial antecedents, has had and is having a distinctly accelerating influence on human progress. In the first place, it has brought and is bringing to all thinking people a quickened sense of moral responsibility as custodians for the time being, of the life which it is their duty to pass along, not only untarnished, but improved, to succeeding generations. It has given a newer and a deeper meaning to ancestral influences and a consequently almost vital signifi-

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is believed that his conception of "biophors," "ids" and "idants" and their respective functions would tend to confuse the reader who is just taking up the subject.

cance to human pedigrees when made to embrace recorded facts of genetic importance. It has furnished data for a revised system of ethics by which more justly to regulate man's relation to man. It has furnished the first rational foundation of education, the exalted function of which in the future must be more and more to deal with known factors of each life, not only as that life is mainfested in the individual, but as that same life was manifested in ancestral individuals. It lays the foundation and the only sound foundation for a rational system of sociology. It reaches with illuminating ray the befogged realms of psychology, and touches with clarifying effect the domains of morality and religion. The relationship between this law and these comprehensive subjects will become apparent as we trace its application through correlated laws to which subsequent chapters will be devoted.

CHAPTER III.

SEXUAL EFFICIENCY.

If, as we have seen, the continuity of life from one generation to another depends upon the union and blending of germinal elements derived from both sexes, it is manifestly of first importance that these germinal elements shall be brought into contact with each other under conditions favorable for their further development. To effect this union is the function of sex, to understand which and especially to understand disturbances of that function, it is important to take into consideration certain additional facts of elementary importance as follows:

The germplasm lies dormant in the individual during the earlier and more active period of growth and becomes inactive or atrophied and disappears with the changes incident to old age.[1]

When a certain stage of growth, known in the male as adolescence and in the female as puberty, has been reached, the germplasm becomes active.

Activity in the germplasm means that its cells increase in size, divide and thus multiply, each new germ cell thus formed becoming a unit, susceptible of blending with a corresponding germ cell or unit from the other sex to form a new individual.

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[1] *Voir*, Law, page 65.

(a) Reproductive Factors in the Male.

The germ cell or generative unit thus formed in the male is a microscopic organism consisting of a head and a tadpole-like tail, and possessing the power of spontaneous movement.

This generative unit, known as a *spermatozoon* (plural, *spermatozoa*), is derived from the perm-plasm which is located in the testes, and which, when combined with certain mucous secretions, comprises what is known as the semen.

The testes, two in number, are oval organs or glands, varying from two to three-and-a-half inches in greater diameter, and are pendulous bodies in a loose sac called the scrotum.

The spermatozoa form in great numbers in the interior of the testes, especially during sexual excitement, and are discharged through a series of long, tortuous ducts.

To effect the fertilization of an ovule under normal conditions, the spermatozoa should be deposited in the vagina, whence, by means of their own power of migration, they reach and fertilize the ovule in the interior of the uterus.

From these facts may be formulated the following:

LAW OF SEXUAL EFFICIENCY IN THE MAN.

(1) *The germplasm must exist in the testes.*

(2) *The germplasm must be capable of cell proliferation and of thus forming normal spermatozoa.*

(3) *The germplasm forms spermatozoa from the period of relatively nature growth (adolescence) to the period of decline incident to old age (senility).*

(4) *The ducts leading from the testes must be sufficiently open to permit the free discharge of the spermatozoa.*

(5) *These ducts must be free from secretions that are poisonous to the spermatozoa.*

(6) *The ability must exist so to deposit the spermatozoa within the vagina that they can migrate thence upward into the uterus to fertilize the ovule.*

(b) Reproductive Factors in the Female.

The generative unit in the female, known as the ovule or egg, is of microscopic dimensions.

The germplasm from which this generative unit is derived is located in the ovaries and is active or capable of producing ovules from the age of about fourteen (puberty) to that of about forty-five when the "change of life" (menopause) is experienced.

The ovaries, two in number, are oval organs or glands about an inch long, located one upon either side and within the pelvic cavity.

The ovule or egg forms on the interior of the ovary and matures within a sac or follicle, known as the Graaffian follicle, which, in process of maturing, migrates to the surface of the ovary and ruptures.

The ovule is thus liberated on the surface of the ovary, where it perishes unless it is picked up by

the floating fringes of a trumpet-shaped tube, (Fallopian tube), through which it passes into the womb, otherwise called the uterus.

In cases in which pregnancy occurs, and they are the only cases here considered, a single ovule and a single spermatozoon come in contact within the uterus, when fertilization or impregnation takes place.

As soon as fertilization occurs, the ovule, now called an ovum, grows fast to the wall of the uterus, and the growth of the new offspring or fetus begins.

The fetus is later nourished within the ovum by blood derived from the mother through a structure called a placenta, which develops at the point where the ovum grew fast to the uterine wall.

The fetus is thus nourished for a period of about 280 days, or during the period spoken of as pregnancy, after which it is forced by muscular contractions of the uterus to descend through the neck of the uterus and the vagina and the bony pelvis, into the world by the process known as birth or parturition. From these essential facts may be deduced the following:

LAW OF SEXUAL EFFICIENCY IN WOMEN.

(1) *The period of relatively mature growth (puberty) must have been attained, and the period of the change of life (the menopause) must not have been attained.*

(2) *The germplasm must exist in the ovaries.*

(3) *The germplasm must be capable of proliferating and thus forming ovules.*

(4) *The ovules thus formed must escape from the wall of the ovary.*

(5) *The Fallopian tubes must be capable of conducting and must conduct the ovules to the uterus.*

(6) *The uterus must be free from poisonous secretions that would destroy either the ovule or the spermatoza.*

(7) *The uterus must be sufficiently normal to carry the new child (fetus) until it has matured—a period of about 280 days (pregnancy).*

(8) *The neck of the uterus, the vagina and the bony pelvis must be in such condition as to permit the child to be born at the expiration of pregnancy.*

APPLICATION OF THE LAWS OF SEXUAL EFFICIENCY.

The application of this law in a general way is so obvious as to require no mention. It is, however, important to mention a fact of great practical importance, namely, that apparent sexual efficiency does not always imply real sexual efficiency. Malformations and organic deficiencies in both sexes often exist when their significance or lack of significance is not understood until after marriage. Acquired sterility in both sexes from injury, new growth, or disease are also agenic factors. These subjects are considered more *in extenso* in the sections on "Race Poisons" and on "Applied Eugenics" (q. v.).

CHAPTER IV.[1]

CHARACTER UNITS.

Life as transmitted in accordance with the laws set forth in preceding chapters always carries with it, first, the general characteristics of race, and second, certain special characteristics of ancestors.

These special characteristics of ancestors, when appearing in progeny, establish what are recognized as "family resemblances." It must be recognized, however, that there cannot be resemblances or similarities or likenesses unless there are corresponding dissimilarities or unlikenesses. This is not only logically necessary, but actually true, as established by universal observation. Identical reproduction never has occurred and never can occur in the sense that a human offspring is exactly like either or both of its parents. The reason for this is found in the fact that there are always two parents and that on the average, each parent has as much power as the other to transmit characteristics to offspring.[2] I say "on the average," because, while we constantly find families in which

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[1] This chapter may with advantage be read in connection with Chapters VI.

[2] *Voir*, Law, page 50.

one child resembles one parent and another the other parent, with rarely, if ever, one that equally resembles both parents, it will be found on analyzing a large number of instances that dominances are about equal as between those derived from fathers and mothers.[3]

These resemblances and differences, likenesses and unlikenesses, are, indeed, caused by the dominance of some trait or traits over another trait or traits in the commingling of traits as derived from both parents. The traits thus transmissable are called *character units.*[4]

VARIATIONS.

When either a character unit or a group of such units (a) is pronouncedly active (dominant), but still within the limits of the racial standard or (b) when it is pronouncedly inactive (recessive), *i. e.*, apparently absent but still leaving the individual within the limits of the racial standard, it is called a variation.

While there is nothing so constant as variation, there is nothing so various as variations. Their

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[3] See Law, p. 50.

[4] The term "*character units*" is here employed instead of "*unit characters*," as usually employed by writers on genetics. I do so because I think it less confusing to stick to the popular conception of "character" as meaning the totality of traits in the individual. These traits, so far as they are heritable, are "units" in the genetic sense; hence they are "units of character," or, more conveniently, "character units."

classifications are numerous. I give but a few examples:

First Classification.

(a) Variations of the body involving any physical attribute that is transmissible—organic variations.

(b) Variations of function involving the power of the different structures and organs to do their work as parts of the human system—functional variations.

(c) Variations of mind involving mental aptitudes and capacities and the exercise of the different recognized mental faculties—psychic variations.

Second Classification.

(a) Variations, the perpetuation of which tends to the degeneracy of the race—agenic variations.

(b) Variations, the perpetuation of which tends to the improvement of the race—eugenic variations.

Third Classification.

(a) Variations that are transmissible or hereditary and that, consequently, must exist in the germplasm—germinal variations.

(b) Variations that are not transmissible or hereditary and that are not therefore character units but pertain only to the body plasm or somatoplasm—somatic variations.

Other classifications, not to our present purpose, are (a) simple and complex; (b) single, multiple,

symmetrical and asymmetrical; (c) definite and indefinite; (d) normal and pathological, etc.

The transmission or continuance of character units, whether in minor degree or as more or less distinct variations, occurs in conformity with what, in the presence of our rudimentary knowledge of the subject, I shall tentatively formulate as

THE LAW OF VARIATIONS.

(1) *Character units of both parents are transmitted to their progeny.*

(2) *Character units of parents do not "blend," but co-exist in their progeny.*

(3) *Character units tend to divide into (a) those that become active or dominant, and (b) those that become inactive or recessive, thus giving rise to variations.*

(4) *Character units that are active (dominant) in one member or one generation of a progeny may be inactive (recessive) in another member of the same or another generation of the same progeny, and vice versa.*

(5) *Character units, thus tending to separate (segregate), may thus be bred out of or bred into a strain or family.*

(6) *The nature of the combination of parental character units which takes place in the germplasm at the time of fertilization predetermines the character units and, consequently, the variations of the offspring.*

APPLICATION OF THE LAW OF VARIATIONS.

Walter, discussing this subject, says (1) of variation that it is "at once the hope and the despair of the breeder who seeks to hold fast to whatever he has found that is good and at the same time tries to find something better. On the other hand, it is exactly these variations which so constantly interfere with breeding true *that furnishes the sole foothold for improvement.*"

It is precisely in the last sentence that the reader, interested in race culture, finds the practical and utilitarian phase of variation. In its relation to selection—which is here used as the synonym of monogamic marriage—the duty of the individual becomes apparent from the terms of the law itself.

If the character units of both parents are transmitted, it is the duty of each to become conversant, before marriage, with their respective transmissible traits and to determine the union upon the eugenic quality of the combined traits or character units, not only as exhibited in the immediate contracting parties, but, if possible, as they have existed in their ancestors.

If character units do not "blend" but co-exist, and if some are active or apparent and others are inactive or not apparent, it follows that the character and significance of a hidden (inactive or recessive) character units may be determined by its previous manifestation in connection with the same

germplasm in previous generations. In other words, it is just here that pedigrees, real pedigrees, pedigrees that record facts of real genetic significance, come to have a serious meaning.

If character units or variations tend to separate, that is, if one tends to become active while another tends to become inactive, it is perfectly evident that selections should be made to keep active and to intensify the good traits until the bad traits are either repressed, suppressed or eliminated "from the blood," for, as indicated by Walter, already quoted, the transmission of variations furnishes the race its only opportunity for advancement.

If by the conveyence and co-existence of known character units derived from parents, the character, physical, moral and mental, of offspring can be even approximately predetermined—and it can—the responsibility of parents, first, to their offspring, next, to themselves, and, finally, to the state and to society becomes doubly acute. It is to this standard of ethics and to this conception of morality that society is rapidly educating itself and by both of which the parents of to-day will be estimated by their progeny of to-morrow.

CHAPTER V.

INHERITANCE.

There is no fact more patent and none more universally recognized than that children inherit physical, mental and moral characteristics from their parents. This, as we have seen, is a law of life applicable to all species and all races. It is furthermore known that races have perished and others have taken their places. Evolution teaches us that races that maintain themselves in the world, do so by progressively adjusting themselves to changing surroundings, and that races that do not do so are retrogressive and tend to their own destruction. This fact is true of races only because it is first true of individual members of such races. If now we couple this demonstrated fact with the equally demonstrated fact that the germplasm is persistent through the generations, we are forced to recognize that the germplasm in the individual represents, in a certain very important sense, the surviving characteristics of that individual's ancestors.

The word "surviving" is here used advisedly. It implies that, in the transmission of traits, something has been lost and something has survived. The principle has a biological foundation with an application that extends even much farther back than to the remotest historic generation. This biologic or evolutional phase is demonstrated in the fact that

each succeeding stage of development in the human embryo represents each succeeding order of life through and out of which human life has evolved. This fact is formulated in what is known as

HAECKEL'S LAW OF BIOGENESIS.[1]

"*The development history (ontogeny) of an individual briefly recapitulates the history of the race (phylogeny); i. e., the most important stages of organization which its ancestors have passed through appear again, even if somewhat modified, in the development of individual animals.*

Or, as felicitously stated by Rignano,[2] "The development of the individual is a rapid repetition of the evolution of the species, a short résumé of the infinite chain of its ancestors."

This principle of inheritance, as applied to the transmission of character units in the human family, may be better understood when we recall that, if there were no such thing as segregation, dominance and recession, with possible outbreeding of character units, the inheritance of such character units would result in their arithmetically progressive accumulation. This does not occur. What does occur is that,

(1) When a character unit from one parent and a like character unit from the other parent co-exist

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[1] Hertwig, "Manual of Zoology," p. 38.

[2] Eugenio Rignano, "La Transmissibilité des Caractères Acquis," p. 7.

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in the germplasm of the offspring, they cumulatively modify the resulting inherited faculty; or,

(2) When a character unit from one parent and an unlike or antagonistic character unit from the other parent co-exist in the germplasm of the offspring, they manifest themselves by the dominance of one and the recession of the other with corresponding modification of the resulting inherited faculty.

In this way human faculties are modified, but not multiplied—a result that corresponds with experience. It was this experience, not then based upon experimental investigation, that prompted Francis Galton, in 1874, to go systematically into the subject. His conclusions antedated those of Mendel and Weismann by many years and were formulated in what is known as

GALTON'S LAW OF INHERITANCE.

(1) *The two parents between them contribute on the average one-half of each inherited faculty, each of them contributing one-quarter of it.*

(2) *The four grand-parents contribute between them one-fourth, or each of them one-sixteenth.*

(3) *The eight great grand-parents contribute one-eighth, or each of them one-sixty-fourth, and so on through preceding generations.*

(4) *The sum of the fractions thus forming the infinite series is always one and each fraction of the series is always equal to the sum of the fractions following it.*

The Application of Galton's Law of Inheritance.

Galton's law of inheritance is one of the most important generalizations that has been offered for guidance in human breeding. Antedating, as it did, the discoveries of both Mendel and Weismann, it anticipated with approximate accuracy deductions that are to-day predicated upon the more definite terms of what are now accepted as the law of heredity and the law of the continuance of the germplasm. The application of this law of Galton's carries with it two conceptions, then as now of fundamental importance, namely:

(1) The germ cell is the summation of its racial antecedents derived in certain more or less definite proportions from each member of preceding ancestral generations.

(2) On the average, as many heritable traits or characteristics are derived from one parent as from the other.

Without having the advantage of the present conception of character units and of the functions of segregation and dominance manifested by them, Galton's formula was offered as an expression of the law of averages as applied to the inheritance of traits or "faculties." Without reference to the necessary revision of its specific terms to make them comply with the more recent and more definite Mendelian *dicta*, it emphasizes two principles of practical importance:

(1) The germ cell is so freighted with ancestral potentialities as to make the previous history of its germplasm through preceding generations a matter of deep concern to the conscientious prospective parent. This fact invests the subject of "family trees" and "pedigrees" with a new, definite and practical importance, particularly whenever the records embrace facts of character-determining significance to the progeny.

(2) The other principle relates to the average equal importance of parents in their hereditary influence upon progeny. The time was not long ago and to some extent still exists when the impression prevailed that woman was the passive element in reproduction, simply serving more or less as the medium through which her consort might demonstrate his parental prepotency. The Galtonian manifesto was the first effective protest against this error and the corrective influence of that manefesto has resulted in a just recognition of motherhood and of its exalted influence in the natural scheme of racial perpetuity. Translated into a working formula, it means that, in prospective marriages, every effort should be made to determine the quality of the germplasm, as determined not only by its more or less masked manifestation in the parties to the proposed union, but by its more completely revealed manifestation in parents, grandparents and even remoter generations equally on the maternal and paternal sides of the family.

CHAPTER VI.

HEREDITY.

The transmission of character units from one generation to another is called heredity.

Although the fact of "family resemblances" has always been recognized, the more important fact that these resemblances occur in conformity to natural law has been reduced to scientific demonstration only within the last few years. The foundation was laid by Darwin in his epoch-making discovery of the law of natural selection and in his theory of the origin of species.[1] (1859). The latter, however, so far as it was based upon Lamarck's doctrine of hereditary transmission of acquired characteristics[2] (1801), has been discredited by the discoveries of Mendel[3] (1885); Weismann[4] (1892); and DeVries (1901); discoveries which have placed the complex problem of heredity as applied to the human family, in a fair way for final solution. In the meantime, Francis Galton began (1871) the promulgation of his experimental investigation of heredity as applied to the human family and which resulted in the formulation of

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1 Law, p. 79.
2 Law, p. 80.
3 Law, p. 54.
4 Law, p. 34.

his law of human inheritance[6] and in the foundation of the science of eugenics, which he defined as "the science of being well-born." Investigations along the line established by Galton, modified and given definite direction by the works of Mendel, Weismann and DeVries, have been conducted by many investigators, conspicuous among whom stand Bateson[7] in Great Britain and, notably, Davenport[8] in the United States.

The large number of factors involved in the complex problem of human heredity makes it necessary that conclusions shall be arrived at only after wide investigation by competent observers. Data for this purpose should be most carefully compiled after which it should be subjected to careful classification and analysis. It is by this process that the law of heredity was finally evolved by Mendel as follows:

MENDEL'S LAW OF HEREDITY.

(1) *Character units are transmitted from each parent to the offspring.*

(2) *In crossing dissimilar parental characteristics, those from one parent tend to become active or dominant, while those from the other parent tend to become inactive or recessive.*

(3) *The first generation resulting from a cross of one parent having a dominant characteristic with*

[6] Law, p. 50.

[7] "Methods and Scope of Genetics" (1908), and "Mendel's Principles of Heredity" (1909).

[8] "Heredity in Relation to Eugenics" (1911),

another parent having a recessive characteristic is a hybrid bearing the dominant characteristic.

(4) *The second generation, the result of crossing dominants with recessives of the preceding generation, manifests an average of three dominants to one recessive.*

(5) *The third generation (a) if bred from pure dominants of the second generation will be made up of pure dominants or, in other words, will breed true and will continue to breed true; (b) if bred from impure dominants (hybrids) of the second generation, the third generation, like the second will be made up of three dominants to one recessive; (c) if bred from pure recessives, or, in other words, will breed true and will continue to breed true.*

(6) *Hereditary character units are independent of each other and tend to segregate out on cross-breeding, regardless of temporary dominance.*

APPLICATION OF MENDEL'S LAW OF HEREDITY TO SELECTIVE HUMAN BREEDING.

Mendel evolved his law primarily from observations on the vegetable world, chiefly upon the domestic pea. Since that time investigators have proven its validity in sunflower, cotton, snapdragon, wheat, maize, barley, tomato, silkworm, pomace-fly, land-snail, mice, guinea-pigs, salamander, canaries, poultry, cattle, horses and man, with the result that it is accepted in general terms as the

law governing the transmission of character units in the organic world.[10]

(a) Individual or Personal Application.

The greatest difficulty so far has been to determine just what are and what are not character units in the Mendelian sense of transmissibility. It will require long observation before all the Mendelian units will be discovered and classified, especially in the human family in which they exist in greatest complexity. So far, the most comprehensive investigation has been made by Davenport from whose excellent summary[11] I have tabulated the following, which I have arranged to conform to my classification:

(1) GENETIC, embracing character units that may or may not have either agenic or eugenic significance.

(A) *Physical:*

Stature, including (a) height, (b) weight, (c) facial expression; (d) form of hair.

Pigmentation, including (a) color of skin; (b) color of eyes, and (c) color of hair.

(B) *Psychic:*

General Mental Ability, manifested by an even balance of mental faculties, including the emotions.

Special Aptitudes for (a) music, (b) art, (c) literature, (d) mechanics, (e) mathematics.

Moral Sense.

Religious Feeling.

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[10] Walter, "Genetics," p. 129.

[11] Davenport, "Heredity in Relation to Eugenics," pp. 27-180, inclusive.

(C) *Temperamental:*
(a) Lymphatic.
(b) Nervous.

(2) AGENIC, embracing character units, the inheritance, and especially those the augmentation of which tend to the deterioration or degeneracy of the race.

(A) *Physical:*
Dwarfism.
Lack of symmetry or balance.
Lack of pigmentation.
Lack of bodily energy.
Organic defects of (a) eye, (b) ear.
Certain organic defects of (a) the eye, (b) ear, (c) skin, (d) skeleton, (e) respiratory organs, (f) reproductive organs, (g) muscular system, (h) circulatory system, (i) nervous system.
Certain diseases of (a) the eye, (b) ear, (c) skin, (d) muscles, (e) blood vessels, (f) blood, (g) glandular system, (h) nervous system, (i) general system.
General degenerative type manifested by (a) alcoholism (narcotism), (b) pauperism, (c) criminality.

(B) *Psychic:*
Feeblemindedness, including defective memory.
Insanity.
Moral sense recessive.
Religious sense recessive.
General degenerative type, manifested by (a) alcoholism, (b) pauperism, (c) criminality.

(C) *Temperamental:*
Extreme lymphatic type.
Extreme nervous type.
General degenerative type, manifested by (a) alcoholism (b) pauperism, (c) criminality.

(3) EUGENIC, embracing character units, the inheritance or augmentation of which tend to the improvement of the race.

(A) *Physical:*

Stature, with (a) efficient bony and muscular development, (b) organic balance, (c) nutritional balance, (d) structural symmetry, (e) general functional integrity.

Pigmentation, normal average standard.

Bodily energy.

(B) *Psychic:*

General mental symmetry and strength (sanity).

Special mental aptitude, e. g., for (a) music, (b) art, (c) literature, or (d) mechanics, (e) mathematics, when such aptitude does not destroy the efficient symmetry of mind.

Memory.

Moral sense dominant.

Religious feeling dominant.

(C) *Temperamental:*

Absence of extreme type.

APPLICATION OF THE LAW OF HEREDITY.

The practical application of the law of heredity to each character unit as well as a consideration of other genetic factors, will be presented as far as justifiable by the present state of investigation in the division on "Applied Eugenics."

The personal application of the law of heredity is threefold, *viz.:*

(1) To determine one's own inherited attributes and potentialities. This can be done only by a careful and unsentimental analysis of the character units of ancestors as far as the facts may be made available. The information is of first importance in enabling man to discharge his first duty, which is to know himself. With this knowledge, the individual has a safer key with which to open the

door to efficiency and happiness. Conduct can thus only be given safe direction. The law of heredity is the fundamental law of rational education and of sound ethics.

(2) To determine the inherited but possibly as yet unrevealed attributes of a prospective husband or wife. What a given strain of germplasm has done in previous generations, it will do in the present generation, except as modified by breeding and restrained by environment. The probable modification by breeding is in many cases predeterminable, due regard being given to the segregation and dominance, but especially to the recession of character units. So persistent are germinal traits that, when pronounced in ancestors, they are liable to exist under mask—under lock and key, as it were—in the progeny or some of the progeny, only, however, to become active in the next succeeding generation. It, therefore, is important for one's *own* happiness growing out of the marital association that probable inherited characteristics shall be determined *in advance* by the terms of the law of heredity.

(3) To predetermine as far as possible the probable characteristics of a contemplated progeny and to interpret such characteristics for the intelligent guidance and protection of children in educational, ethical and social relations. This phase of personal duty on the part of each parent cannot be ignored, nor can the penalty for failure in the discharge of this duty be evaded. On the one hand,

we see everywhere the fortunate, even if accidently fortunate, operation of the law of heredity followed by harmonious matings and by children that are at once a joy to their parents and a benefaction to the race. On the other hand, we, with startling frequency, see this same law operating with merciless certainty in effecting the misery of those who, through ignorance or wilful disregard, seem to court its penalties rather than its rewards. Turbulent homes, divorce courts, orphan asylums in the foreground with all the long train of institutions for degeneracy and crime in the more distant perspective make up the forbidding picture that illustrates one phase—the agenic phase—of this law in its application to the individual.

(b) Racial and Social Application.

While the application of the law of heredity to the human family must always be primarily individual and personal, that very fact speedily develops into national racial and social significance. In this broader application of the Mendelian principle, several general lines of activity are suggested by the nature of conditions that are thus susceptible of modification. The grand army of degeneracy presents the problem in the concrete. This army is made up of the "unfit"—the products of the agenic factors in heredity (q. v. *ante*). These factors and their intelligent control will have further consideration in the chapter on "Applied Eugenics."

(c) Economic Application.

The relation between economic and genetic problems is precisely as intimate as the relation between food and shelter on the one side and health and efficiency on the other. The principle enunciated by Herbert Spencer that, other things being equal, the best conditioned progeny is the best progeny, stands inviolate. Therefore, the application of any laws or principles that tend to the betterment of material conditions tends likewise to the betterment of the race. The laws and principles of genetics have exactly that value. In the vegetable world, its practical application is far-reaching, for, remember, the principles of genetics apply not only to the human, but to the whole organic world.

CHAPTER VII.

THE HUMAN NORM.

The investigations of Sir Francis Galton tended to prove what everybody very generally recognizes, namely, that there is a constant tendency in progeny to approximate the average standard or mean, or norm, of the race. This implies that while like tends to breed like, there is also a certain tendency on the part of those of lower standards, through matings with others of better standards, to produce a progeny that approximates the average mean or norm of the race. This process is obviously one of progression. It is equally implied that there is a certain tendency on the part of those of high standards, through matings with those of lower standards, to produce a progeny that approximates the average mean or norm of the race. This process is obviously one of regression. Galton, however, spoke of both processes as "regression," and formulated a law under that title,—the "Law of Regression"—a title clearly misleading. I have accordingly changed the title, and have slightly modified the wording without changing the meaning of this law to read as follows:

GALTON'S LAW OF THE MEAN.

(1) *Average parents tend to produce average children.*

(2) *Parents of high character units tend to produce children of high character units.*

(3) *Parents of low character units tend to produce children of low character units.*

(4) *Extreme parents, whether of high or low character units, tend to produce children with less extreme character units.*

APPLICATION OF GALTON'S LAW OF THE MEAN.

The practical purport of the Law of the Mean is that all families, indeed all populations, left to themselves, have a tendency to breed to mediocrity. This process is not to be confused with "atavism," which Walter speaks of as "grandparentism," and which means that a given individual may not resemble his or her parents, while showing a striking general resemblance to some one grandparent. Nor must the trend to the mean be confused with the process of "reversion," which simply means that given character units that have been recessive for several generations have become active. The trend to the mean simply means the averaging of characteristics. It finds its completest expression in "pure lines," in which individual members all conform to the average standard. Pure lines, however, furnish relatively definite factors, so that when two of them, each with its own mean, are intermarried, the resulting mean may be somewhat accurately predetermined. It is for this reason that the practical breeder always tries to secure only

pure strains, for in that way only can he maintain a profitable standard. Precisely the same law applies to human mating with the difference that the results are of vastly greater concern to the individual and to society.

Galton investigated the application of the law to human stature with the result that the fluctuating variability of succeeding generation tended in the direction of the ascertained mean of the entire strain. The universality of the law has since been demonstrated in other phases of life. It follows, therefore, in populations made up of diverse strains, the highest mean can be maintained only by intelligent union of pure strains. What is true of populations in the general sense of the word is emphatically true of the family, which, as Mr. Lecky states, we must accept as the archetype and unit of society.

CHAPTER VIII.

GROWTH AND REPRODUCTION.

Organisms do not reproduce their kind until they have maintained approximate maturity. The period of growth is therefore a period of germinal latency or sexual inactivity. The period of mature germinal or sexual activity is normally a period of relatively stable nutritive activity manifested by but slight variations in either stature or weight. The decline of germinal or sexual activity is normally characterized by an increase in nutritive activity, manifested by increase in weight. The sudden increase of weight during the physiological period of sexual activity disturbs the equilibrium between growth and genesis characterized by a decline in sexual activity, verging at times into sexual incapacity.

CARPENTER'S LAW OF ANTAGONISM BETWEEN GROWTH AND GENESIS.[1]

(1) *There is a certain degree of antagonism between the nutritive and reproductive functions, the one being executed at the expense of the other.*

[1] Principles of Physiology, General and Comparative, by W. B. Carpenter. Third Edition, 1851, p. 592, quoted by Herbert Spencer, who independently arrived at the same conclusion a year later. (Principles of Biology, Vol. II, p. 439.)

(2) *The reproductive apparatus derives the material of its operations through the nutritive system upon which it is entirely dependent for the continuance of its function.*

(3) *When, therefore, it (the reproductive apparatus) is in a state of excessive activity, it will necessarily draw off from the individual some portion of the element destined for the individuals maintenance.*

(4) *It may be universally observed that, when the nutritive functions are particularly active in supporting or developing the individual, the reproductive system is in a corresponding degree undeveloped.*

APPLICATION OF CARPENTER'S LAW OF ANTAGONISM BETWEEN GROWTH AND GENESIS.

The first factor in sexual efficiency, and therefore the first factor in eugenics, is the necessary maturity of both parties to the reproductive act. In other words, the germplasm must have a certain amount of nutritive support from the general system before it begins to form and throw off the cells that go to make the spermatozoa in the male and the ova in the female. This nutritive support is not given to the germplasm during the period of general bodily growth. It would seem as if nature in its wisdom were satisfied with the task of building up one body before taking up the task of building up other bodies from the same germinal material. We have here exemplified Dr. Carpenter's law of

antagonism between growth and genesis already quoted, which law, translated into plain English, simply means that while a body is growing it has not the capacity to reproduce itself and that the degree of incapacity is relative to the intensity of the growth. In the lowest form of life—that form of life in which reproduction, or genesis, occurs by the simple process of one cell dividing itself into two cells, the parent cell does not thus divide until it has reached the stage of maturity, however quickly that stage may be reached. The cocoanut tree grows six years before it shows signs of fertility and from eight to nine before it actually reproduces, when its growth practically ceases. The fowl does not lay eggs until she is relatively mature, and the pullet lays fewer eggs than the hen that has attained maturity. The yearling sow has smaller litters and feebler pigs than are borne by the brood sow that is from six months to a year older.

Sexual capacity, that is, the capacity to reproduce, is attained by human subjects at various ages in various latitudes. In the more tropical countries, both boys and girls mature at much earlier age than in colder climates. In Mexico, Central America, and the more southern countries, as in equatorial Africa and India, puberty is often attained at as early as nine years; in the northern United States, Canada, Great Britain, Germany and the Scandinavian countries, the average age is about thirteen years. This simply means that, under the influence

of the warmer climates, nutrition is so stimulated that a certain minimum growth is reached earlier than under the more repressive influence of colder climates and that when such minimum growth has been realized, the nutritive energy is expended in developing the germplasm and making it active. In the male, this period is externally manifested by the growth of the genital organs, the appearance of hair on the pubes, breasts, and under the arms, and by the development of a more masculine tone of voice.

In the maiden, there are analagous changes. The vulval organs and the mammary glands develop; the waist narrows and the hips broaden; hair appears upon the vulva and under the arms; and the voice becomes deeper, richer, mellower and more essentially feminine. The most marked change incident to this period, however, is the appearance of the menstrual flow. This is the discharge of blood which oozes from the inner surface of the uterus, and escapes through the vagina. It recurs about every twenty-eight days, although it may recur at intervals somewhat longer, or somewhat shorter, each individual being, within certain limits, a law unto herself. Menstruation, to be normal, should last from two to five days, and the amount of blood should not be sufficient to produce exhaustion. Any pronounced departure from this average standard is abnormal and calls for professional investigation. I shall have more to say about this phase of the subject under the division of this book devoted to

agenic conditions, or conditions that interfere with and even tend to destroy the power of reproduction.

Now, this period of maturity that we speak of as adolescence in the male and as puberty in the female means that the possibility of reproduction has become established. That is to say, the germplasm has become sufficiently developed and is now sufficiently nourished in the male to produce spermatozoa, and, in the female, to produce ova or ovules. It does not, however, mean either that the full growth of the body has been attained, or that the germplasm is being so nourished as to represent its full power in reproduction. It must thus be seen that there is a sharp distinction to be drawn between reproductive capacity, which is established at puberty, and reproductive efficiency, which is not attained until years after, when the body has attained its maximum of growth and when, as a consequence, its still accumulating energy can be more exclusively devoted to reproduction.

This generalization leads logically to two facts of great genetic importance; one, strictly agenic, is that abnormally early marriages are damaging, both to the parents and to the offspring; the other, strictly eugenic, is that, other things being equal, marriages that occur only after maturity of the contracting parties are the most satisfactory, both to the parents and their offspring. Each of these declarations is of sufficient importance to call for separate consideration.

EVIL OF CHILD MARRIAGES.

Early reproduction is to be considered with reference to its influence more particularly upon the mother and the offspring, although its influence upon the father and upon the race is to be taken into account. In the instance of the mother, we are taken back at once to Carpenter's law, relative to the antagonism between growth and genesis. He used as an illustration, the fact known and observed by breeders that, if a filly is allowed to bear a colt, or if a heifer is allowed to have a calf, both become stunted by their experience. In other words, if, in a growing woman, the forces of nutritive origin are diverted from the growth of her body to the nurture of her offspring, both before and after it is born, her own body, at least during pregnancy and lactation, is robbed of just that much of the nutrition that is necessary to bring it to maturity. If such an early pregnancy, especially if followed by the usual period of nursing at the breast, is not accompanied and succeeded by a compensating forced nutrition and more or less freedom from laborious activity, the disastrous results upon the development of the mother will be lasting. Some of the most perplexing problems that I have been called upon to solve relative to the arrested development of young women have had their origin in early pregnancies.

The influence of too early parenthood is disastrous to the offspring. Every poultry-raiser knows

that the eggs of the pullet, even if fertilized, but rarely hatch and that, if they do hatch, the resulting brood is of poorer strain. The filly's colt and the heifer's calf are inferior to the offspring of the same respective sires by maturer mothers. Precisely the same fact is true on the average with respect to early offspring from immature human parents. The causes are many. In the first place, the germplasm of the youthful father, in the absence of its fully developed activity, in the absence of its full nutritive support, in the absence of its full dynamic relation to his general organism, obviously cannot carry the potentiality that will impart even the normal mean of vigor to the offspring. Precisely the same fact is true of the mother. Nutrition of the offspring before birth must be below normal when even a part of the mother's nutrition is used for her own growth. The nutritional phase of this question will be treated more at length in the chapter on the relation of food to fecundity.

The influence of child-parentage upon the race is simply the aggregate of deteriorative influence upon individuals of that race.

In Turkey and other Mohammedan countries, it is the custom to recruit a harem with a child-wife, with the object of thus stimulating and prolonging the waning virility of the old man at the head of it. In this way, it often happens that a child-wife becomes the child-mother of an old man's offspring, with the result that is now observable in the phy-

sical, mental and moral degradation of the average Mohammedan population.

Now, I wish to draw a sharp distinction between child marriages and so-called early marriages. By child marriages, I mean marriage at any time during growth and before maturity as manifested by the attainment of full average stature has been reached. This may mean, in the case of women, any time between puberty and seventeen, eighteen or nineteen; and, in the case of men, any time between adolescence and twenty or twenty-one. By early marriages, I mean those which are contracted at or very near the period when the individual attains full stature. It is the fashion of some eugenists, Mr. Galton among them, I am sorry to admit, to advise early marriages. The excuse given is that, by beginning early, parents may have more children, with, consequently, a wider range of desirable variations than if child-bearing were postponed to a period of riper maturity.

The point is not well taken; in fact, the contention is defective at every turn. Even after full stature, by which I mean full height, has been attained, the next few months or even years show that nutritive energy is largely expended in rounding out, widening, or, in other words, maturing the organism. This simply means that much of growth remains to be accomplished, even after full stature has been reached. It follows, therefore, that all the reasons that I have urged against child marriages are to be urged in only less degree against early

marriages as herein defined. The law of antagonism between growth and genesis never quite ceases to apply as long as growth is still in progress.

The significance of this fact is shown in the conclusions which Mr. Galton himself has drawn from his study of English judges,[2] only 17 per cent. of whom he found to be eldest sons, and 11 per cent. only sons; second sons, 38 per cent., and third sons, 22 per cent., making 60 per cent. in all, showing the great preponderance of success among the offspring of maturer life. While this is true, it is likewise true that sons later than the third made up but 12 per cent. of the total. The meaning of this exhibit is that success in life, as indicated by the attainment of classification in the judiciary of England, was achieved by the offspring of middle-aged and consequently of mature parents in much larger proportion than by the offspring of parents in either the crescendo or the decrescendo of sexual life. The weight of this testimony is clearly against the advisability of early marriages and, consequently, early reproduction viewed from a strictly eugenic standpoint.

Sir Arthur Mitchell[3] found that 31 per cent. of 433 idiots investigated were first-born children.

Havelock Ellis[4] analyzed the ages of 299 fathers at the birth of their sons who came to be classified under the head of geniuses. Of these, two

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[2] Hereditary Genius.

[3] Edinburgh Medical Journal, January, 1866.

[4] A Study of British Genius, p. 120, *et seq.*

were under twenty, and nine between twenty and twenty-four, which may be called the limit of the period of early births. After this period of early paternal age, 292 of the 299 geniuses were born of parents ranging from twenty-five to sixty and more years old. The three prolific periods of five years each were from thirty to forty-five. Only 16 wer born of fathers who were fifty-five and beyond, thus again showing the crescendo and decrescendo of sexual efficiency and hereditary potentiality at the extremes of sexual life.

CHAPTER IX.

Food and Fecundity.

It has been noted that the relationship between the germplasm and the body in general is primarily nutritive. If the body is well-nourished, the germplasm, under normal conditions is correspondingly well-nourished and is correspondingly capable of that cellular activity by which reproduction is effected. It has not yet been demonstrated that low bodily nutrition has any distinctly deteriorating influence upon character units that are represented in the potentialities of the germ cells. But the reproductive capacity, *i. e.*, the sexual efficiency, of the individual is primarily a somatic or general bodily function[1] and, as such, necessarily depends in large measure upon bodily nutrition. It is notably true that years of famine are years of lowered birth rate. It is notably true, also, that children born under circumstances of impaired maternal nutrition, are less favorably endowed on the somatic side, are less resistent and consequently less liable to survive the periods of infancy and childhood than those born of well-conditioned mothers. Herbert Spencer[2] quoting DeBoisment and Scukits, calls attention to the fact that, in Austria and France, the reproductive age is reached a year later by women of the

[1] See chapter on "Sexual Efficiency," p. 37.

[2] "Principles of Biology," Vol. II, p. 462, Sec. 355.

laboring class,[3] than by middle class women, a result due, no doubt, to both lowered nutrition and to greater expenditure of energy in laborious occupations. It is obvious from these considerations that, from the view-point of practical eugenics as applied to both the individual and to communities, much importance must be attached to

SPENCER'S LAW OF THE RELATIVITY OF GENESIS TO NUTRITION AND EXPENDITURE.[4]

(1) *Other things being equal, fertility always increases as nutrition increases.*

(2) *After individual growth, development and daily consumption have been provided for, the surplus nutriment measures the rate of multiplication.*

(3) *Children of inferior parents, reared in inferior ways, will ever be replaced by children of better parents reared in better ways.*

APPLICATION OF SPENCER'S LAW OF THE RELATIVITY OF GENESIS TO NUTRITION AND EXPENDITURE.

Not only the practical application, but the fundamental character of this law, or of these laws, become apparent when we take into consideration the meaning of the constituent terms. Thus, by

[3] "Principles of Biology," Vol. II, p. 284, Sec. 36.

[4] "Principles of Biology," Vol. II, p. 462, Sec. 355.

genesis is here implied the act of human reproduction; by nutrition is implied the supply of material to take the place of that consumed in maintaining the vital functions; and by expenditure is here implied the outgo of energy necessarily incident to human activity. If, now, we recognize that food is fuel, the burning of which generates energy, we at once see that the food supply must be equivalent in its energy-producing power to the energy actually expended, if we are to maintain the normal standard of even industrial efficiency. But Mr. Spencer has shown that, the phenomenon of reproduction being taken in all of its bearings, the energy available for reproductive purposes is really the residual energy after the expenditure for other functional or industrial activity. The apparently greater relative fecundity of some working people as compared with other conditioned people is often accepted as a contradiction of this postulate. An analysis of such instances shows that so many other factors enter into the problem that they prove rather than disprove the rule. The overworked and underfed family is generally either a family of low fecundity, or the offspring will tend to unfitness. It is just here that eugenics absorbs as subsidiary themes the great problems of economics as applied to natural efficiency. (See "Pauperism.)

CHAPTER X.

NATURAL SELECTION.

Individuals of the same species die while others survive under apparently equal conditions of environment.

These differences are realized in the course of activities that are spoken of collectively as the struggle for existence.

The conditions of environment being equal, or approximately equal, the wide difference in results must come from correspondingly wide differences of characteristics manifested by and within the different individuals.

The individual that possesses characteristics which enable him (a) to become harmoniously adjusted to his environment, (b) to resist disease-producing or other inimical influences inherent in environment, and (c) to exercise harmoniously and with even balance the functions of his organism, is best calculated or is most "fit" to survive and does best survive the vicissitudes in the struggle for existence.

The individual that does not possess the characteristics enumerated in the previous paragraph is relatively "less fit," or may be even "unfit," to survive the vicissitudes in the struggle for existence and, unless aided, is liable to perish in the constant conflict.

The result in the instance of every individual, when left to himself, is determined by the operation of natural laws, and the process is, therefore called "Natural Selection," or the "Survival of the Fittest."

The law governing this process, the most far-reaching and momentous in its relation to life in every one of its myriad forms, and especially to human life, was formulated by Darwin and comprises the pith and sap of Evolution.

DARWIN'S LAW OF NATURAL SELECTION.

(1) *Organisms that have the greatest adaptability to their environment survive other similar organisms that have less adaptability to their environment.*

(2) *The ability, or relative absence of ability, of organisms to adapt themselves or to be adapted to their environment is inherent in the respective organisms.*

(3) *The adaptability of organisms to environment may be accomplished by "the gradual development of the individual differences which are favorable to the preservation of life of the individual with corresponding gradual extinction of those peculiarities which are unfavorable to that end; also, the transmission of such modified characters to offspring and so the perpetuation of some species and the extinction of others."*

This phase (Par. 3) of Darwin's law, so far as it implies the hereditary transmission of acquired

characteristics, has been very generally discredited in common with the similar law of Lamarck, upon which it seems to have been based, and which is as follows:

LAMARCK'S LAW OF TRANSMISSION OF ACQUIRED CHARACTERISTICS.

(1) The development of organs and their force of power of action (functional capacity) are in direct relationship to the employment of such organs.

(2) All that has been acquired or altered in the organization of individuals during their lives is preserved and transmitted by generation to individuals *that spring from those that have undergone these changes.*

(3) The manifestation of acquired ancestral characteristics in offspring is relative to the length of time and the persistence of their activity (use) in the ancestors of such offspring.

OPERATION OF THE LAW OF NATURAL SELECTION.

What then are some of the adverse conditions and influences with which the individual has to contend? What is the nature of the battle that must continuously be waged for existence and especially for the highest order of existence? This battle begins from the moment of birth. Unseen enemies, the various disease-producing germs, may lurk in the

unclean folds of a mother's nipple; they may infest the milk or other pabulum of nourishment; or, they may be transmitted by a kiss which may speedily put the infant's powers of resistence to an extreme or even fatal test. The demands of school, or, when poverty compels, the exactions of industry sap the youthful vitality. Climate, the elements of the soil, the quality of water, the nature of the food supply, social and economic influences, all enter into the category of conditions to which, at each succeeding stage of life, the individual is either harmoniously adjusted or is not harmoniously adjusted. Harmony of adjustment to conditions that exist in one's surroundings means that one has conformed to the laws of well-being. They are inefficient, or, as Herbert Spencer says, they are "unfit," and, according to their measure of unfitness, they lag, stumble, fall or die in the conflict. They that live, live by natural selection; they that die, other than physiological deaths, die by natural selection. It is for this reason that the law of natural selection is called "the law of the survival of the fittest."

The fitness or unfitness of an individual, all other conditions such as education and environment being equal, is determined entirely by the law of heredity. The child is what the parents were, for the simple reason that it is not only "a chip *of* the old block," but "a chip *off* the old block." Its fundamental qualities have been imposed upon it by inexorable decree. So far as these qualities tend to strength,

efficiency and morality, the operation of the law is beneficient;—so far as they tend in the opposite direction, the law left to itself is cruel, remorseless and inexorable in its disastrous effects upon the individual.

And just here is the beginning of ethics. What right have we with this law, with the law of cause and effect, with the laws of human breeding, with the law of heredity to guide us—I say, what right have we to bring into the world a progeny unfit for the struggle? What moral right have we to impose existence upon offspring, when, by virtue of these laws, we know in advance that, in the unequal conflict for existence, such offspring are foredoomed to pain, misery and abnormal death? And what are we to think of ourselves when we realize that, by following primitive impulse, untempered and unguided by the intelligence with which we are surrounded, we are responsible for sending such strains of degeneracy down through the generations? The answer to these questions forces the ethical obligation home to every parent, actual and potential, in the human race.

Yet, this same law, cruel and inexorable to the individual victim, is the most beneficent of all laws in its effects upon the race. Through its operation, the unfit are largely eliminated from the race and many poisoned currents of hereditary deficiency and degeneration are thus kept from flowing on through the natural gates and alleys of succeeding genera-

tions. And this brings up another point of eugenic ethics—a point which while not an indictment of the sacred sentiment of love, is yet an arraignment of the intelligence, or rather the lack of intelligence, that is sometimes back of it. For love, the very highest of human love, is to-day finding a large field of activity in caring for the hereditary victims of the law of natural selection. Charity, expressing itself in open-handed relief, and benevolence showing itself in great institutions for the insane, feeble-minded, deaf, dumb, blind, epileptics, criminals and delinquents, seek to assuage the suffering that can never be entirely overcome. This is as it ought to be and must be among peoples actuated by the humane impulses of Christian civilization. But, unfortunately, while the practical operation of our philanthropy is to make the unfit more fit, it can never make many of them fit enough in their turn to propagate an efficient, or, in other words, a fit progeny. In this way, the law of natural selection is being largely annulled and its protective influence is being withheld from the race. I plead, therefore, for a broader, deeper, higher phase of Christian love, and I plead for a more fundamental principle of man-to-man ethics, when I plead for a continuance of every kindly care of the unfortunate of to-day combined, however, with adequate protection against the preventable transmission of corroding taints which, if unchecked, will in turn send future generations in increasing numbers as martyrs to the Juggernaut of natural selection.

This can be done in a certain measure, by (a) statutory limitation of marriage among certain defectives; (b) the actual sterilization of certain limited classes; but above all by (c) education and the exercise of intelligent voluntary selection as a substitute for natural selection, the utilization of knowledge and reason to repress mere impulse and give intelligent direction to ineffaceable instinct.

DIVISION II.
The Race Poisons

CHAPTER XI.

The Social Diseases.

There are two diseases, or rather, the active agents in their causation that are with propriety designated as "race poisons." One of these diseases exercises its pernicious influence upon the race, not by being transmitted from one generation to another, but by causing the sterility of many of those who are the victims of its ravages. The other, while unfortunately but rarely causing sterility, does in all instances cause either temporary or persistent inefficiency, often inducing permanent invalidism in its adult victims while inducing in their progeny malformations and defects, physical and mental, that fill life with pain until early death puts an end to sensibility.

The fact that these maladies have made alarming encroachments upon the race is due to the fact that, until recently, idiotic convention has decreed that it is bad form to enlighten the people upon a topic that is sapping the vitality of countless thousands while taxing with oppressive burden the resources of philanthropy and of the state. The condition, as it existed in London but a few decades ago was graphically depicted by Mr. Lecky in his "History of European Morals," as follows:

MR. LECKY ON SOCIAL PRUDERY.

"It is argued," says Mr. Lecky, "that, however persistently society may ignore this form of vice, it exists nevertheless, and on the most gigantic scale, and that evil rarely assumes such inveterate and perverting forms as when it is shrouded in obscurity and veiled by a hypocritical appearance of unconsciousness. The existence in England of certainly not less than 50,000 unhappy women, sunk in the very lowest depths of vice and misery, shows sufficiently what an appalling amount of moral evil is festering uncontrolled, undiscussed, and unalleviated under the fair surface of a decorous society. In the eyes of every physician, and, indeed, in the eyes of most continental writers who have adverted to the subject, no other feature of English life appears so infamous as the fact than an epidemic, which is one of the most dreadful now existing among mankind, which communicates itself from the guilty husband to the innocent wife, and even transmits its taint to her offspring, and which the experience of other nations conclusively proves may be vastly diminished, should be suffered to rage unchecked because the legislature refuses to take official cognizance of its existence or proper sanitary measures for its repression. If the terrible censure which English public opinion passes upon every instance of female frailty in some degree diminishes the number, it does not prevent such instances from being extremely numerous, and it immeasurably

aggravates the suffering they produce. Acts which in other European countries would excite only a slight and transient emotion spread in England over a wide circle all the bitterness of unmitigated anguish; acts which naturally neither imply nor produce a total subversion of the moral feelings, and which in other countries are often followed by happy, virtuous, and affectionate lives, in England almost invariably lead to absolute ruin. Infanticide is greatly multiplied, and a vast proportion of those whose reputations and lives have been blasted by one momentary sin are hurled into the abyss of habitual prostitution—a condition which, owing to the sentence of public opinion and the neglect of legislators, is in no other country so hopelessly vicious or so irrevocable." None can gainsay that these eloquent words may be applied with equal severity to American conditions wherever and whenever they are controlled by maudlin sentimentality—that is too generally permitted to control our States and municipalities.[1]

A PHASE OF "RACE SUICIDE."

While the public sentiment scathingly portrayed by Mr. Lecky has changed, the change has only come because the hypocritical policy of ignorance and pretension has produced a condition that has become intolerable to every person actuated by the combined influences of intelligence and human sympathy. The writer of these pages has professional

[1] "The American Family," by Charles A. L. Reed, 1905.

knowledge of over five thousand women who have been sterilized by gonorrhoea, nearly two thousand of whom have had to submit to dangerous and mutilating operations to save their lives. He has direct knowledge also of many hundred men, and inferential knowledge of many other hundreds who have been sterilized by the same disease. He is only one surgeon, one operator, of whom there are several thousand in the medical profession of the United States, numbering nearly 150,000 members, in a nation of over 92,000,000 people. Syphilis, the great hereditary disease of the race, is even farther reaching in its degenerative influence upon humanity.

THE SOCIAL PURITY MOVEMENT.

Fortunately, the state of public sentiment of which Mr. Lecky wrote in 1874, has given way to saner views in the second decade of the twentieth century. In Great Britain and in America, medical, social and civic organizations, some of them created for the purpose, are educating the people on questions of sex hygiene and race culture. Great magazines and the daily press are lending aid to the propaganda. The pulpit is using its mighty leverage for the uplift. Professional men and women are laying aside their daily occupations long enough to go before large and interested audiences with the tale of pain and unhappiness, of disease and death wrought by the two diseases that, even in spite

of the repressive influence of agitation, are yet insidiously, but all too surely extending their ravages throughout the race. As a result of this world-wide movement, with its enlightening influence, it is now fortunately no longer an offense to tell parents what to teach their children in sexual matters; it is no longer a crime, under proper circumstances, to warn an innocent young woman against the possible pitfalls that await her in the marriage state; it is no longer criminal to make a young man understand what honor and decency demand of him when he aspires to husbandhood; it is no longer a sin to make both comprehend the responsibilities of parenthood, and it is no longer bad form to discuss the problems of human breeding and the consequent welfare of unborn generations. It is with these various objects in view that I invite careful consideration of the subjects of gonorrhoea and syphilis.

GONORRHOEA.

Gonorrhoea is a contagious disease that depends for its existence upon a germ known as the *gonococcus*. This is a minute organism consisting of two spherical halves which give to it something of the appearance of a dumb-bell without the hand space between the bulbous extremities. It multiplies very rapidly and has the faculty of destroying the delicate protective layer of any mucous membrane with which it may come in contact. In destroying this

layer of the mucous membrane, it produces pus, which, if absorbed into the general system, causes a form of blood-poisoning. The *gonococci* themselves may be absorbed into the blood, and give rise to symptoms of rheumatism and inflammation of the joints.

Gonorrhoea is ordinarily communicated between men and women by sexual intercourse, which may be said to be the sole method of communication when the disease is restricted to or first occurs in the genital organs of adults. In the case of infants and children, it is generally communicated by the unclean hands, garments, or toilet articles of infected parents. In new-born infants the eyes are infected in the course of parturition from an infected mother.

The significance of this disease, its ravages upon the human system, its destructive effect upon the fecundity of the individual, and its agenic influence upon the race can be better comprehended if I trace its symptoms and natural course in (a) men, (b) women, and (c) in infants and children.

(a) Gonorrhoea in Men.

The disease starts in from one to three days after exposure. It begins with a slight yellowish discharge and an equally slight sense of irritation at the orifice of the urethra,—so slight, indeed, that both symptoms may for a time fail to attract attention. Then, suddenly, the discharge increases in volume and the irritation increases to a keen sense of smarting and

burning at urination. When this stage has been reached, the disease is thoroughly established inside the first three-quarters of an inch of the urethra, with a constant tendency to travel upward to the bladder.

If the invasion is not arrested within the urethra by prompt recourse to skillful treatment, gonorrhoeal inflammation of the bladder results. This is characterized by intense, burning pain in the bladder, by most copious secretion of mucus and pus, which are discharged with the urine, and by a constant desire to urinate, each effort being associated with intense straining. In occasional instances, the straining is followed by the appearance of blood in the urine.

When the infection reaches the bladder, it generally also involves the prostate gland, a three-lobed structure located at the neck of the bladder. These lobes become swollen and painful. Their increased size converts them into a sort of ball-valve that interferes with the free outflow of urine. In some cases this outflow is so completely obstructed that the urine has to be drawn off by means of a catheter—a dangerous procedure in the acute stage of the disease. Sometimes this acute infection is so great that the prostate becomes the seat of abscesses, which either break into the bladder or have to be opened from the outside by a formidable operation. In nearly every case in which the prostate gland has been the seat of gonorrhoeal infection, the subsidence of the acute process leaves the gland permanently

enlarged. This enlargement has a tendency to increase with advancing years, often necessitating the complete removal of the prostate gland itself. It should be here stated for the benefit of many honorable old men with clean lives that gonorrhoea is not the only cause of enlargement of the prostate necessitating the removal of the gland.

If the disease has reached the prostate, it is liable to go further and involve two little ducts or canals, called the seminal vesicles, or even the testicles themselves. In either event there is involvement of either the whole or a part of the highway through which the spermatozoa, the germ element, the creative element of the male, must pass to do its work of fecundation. It is important to remember this fact in connection with two things, either one or both of which may now occur. The first is that as a result of the inflammation started by the gonorrhoeal invasion, the seminal vesicles become closed. In certain cases this closure becomes permanent. In either event the sterility of the patient is absolute, so long as this obstruction exists. The other thing that I desire to emphasize takes place from the very beginning of the infection of these vesicles, and is of the utmost importance as an agenic factor. It consists of the fact that *a seminal vesicle once infected with gonorrhoea is always infected,*—unless, as is now occasionally done, it is opened and drained by surgical interference. This simply means that an infected seminal vesicle, after the acute stage has passed, remains a perpetual fountain-head of infec-

tion. This condition is often so nearly without symptoms that men, believing themselves to be well, infect their wives with the loathsome malady. These hapless victims in turn not infrequently forfeit their own power of reproduction, while many an innocent wife and mother has given up her life, an unconscious martyr to this unsuspected cause. (See "Gonorrhoea in Women.")

When the disease extends to the testicles, they become inflamed and swollen, and sometimes suppurate, making it necessary to drain off the pus by surgical procedure. After the acute symptoms subside, the testicles shrink or atrophy, and the germplasm suffers accordingly, being no longer capable of forming spermatozoa that can communicate life. In other words, *men, both of whose testicles have been the seat of gonorrhoeal inflammation, are liable to be and generally are completely and permanently sterile.*

It is unnecessary in this connection more than to mention the fact that this same infection may extend to the kidneys and destroy one or both of them, or it may extend through the lymphatics, causing abscesses to form in the groins or other localities. These and other features belong to the natural history of the disease, but have only an incidental relation to the question we are here considering,—namely, the influence of gonorrhoea on the power of reproduction in men. Among the facts already given, those which need special emphasis may be summarized in the following

Agenic Laws of Gonorrhoea in Men.

(1) *Gonorrhoea in the male is a communicable infection, the germs of which may persist and may communicate the disease long after its active symptoms have subsided.*

(2) *This latent form of the disease can be detected only by careful microscopic examination of secretions from the genito-urinary tract.*

(3) *When the disease has extended to the upper seminal tracts, it is liable* (*a*) *to have completely destroyed the germplasm itself, or* (*b*) *to have obstructed the canal, thus preventing the discharge of the germinal elements.*

Examination to determine the presence or absence of latent or chronic Gonorrhoeal Infection in Men.

This examination can be made effectively only by a competent medical adviser. The fact that it is undertaken at times by medical men without the technical qualification and without necessary equipment, has more than once put a husband of honorable intentions in the humiliating attitude of having infected his innocent and confiding wife. The examination should be conducted as follows:

First Method: A sample of urine, preferably that first passed in the morning, should be examined a few hours after being voided. All sediment should be precipitated by a centrifuge and then carefully examined under the microscope. If *gon-*

ococci are found, it proves that the disease is present and the examination need go no further. *If gonococci are not found by this examination, that fact is no evidence whatever that the disease does not exist.*

It is just here that serious consequences are liable to result from the thoroughly stupid and all too prevalent assumption that if, in a given case of gonorrhoea in which the discharge has ceased or has become slight, *gonococci* cannot be demonstrated in the sediment of urine that has been voided in the ordinary way, then gonorrhoeal infection no longer exists. Thereupon the patient is told that he is "all right" and advised that he may marry with safety to his prospective wife. Now, as a matter of fact, a physician who will assume to offer an opinion based upon such an examination, by that very fact demonstrates that he is either too ignorant, or too careless, or too dishonest to be entrusted with the responsibilities involved in the case.

This becomes apparent when it is remembered that chronic gonorrheal infection may and generally does lurk either in the prostate gland, in the seminal vesicles, or in the remoter seminal passages. It follows, therefore, that such an infection may exist without the germs reaching the urinary tract except at rare intervals, and may never result in a perceptible discharge except in emission incident to sexual intercourse,—precisely the time when the disease is communicated to the unsuspecting victim. It is evident that, to avoid this calamity, it is nec-

essary to determine in advance whether or not the infection exists in either the prostate gland, the seminal vesicles, or the deeper seminal ducts.

Second Method: This can be done by either of two ways:—

(a) Some of the seminal discharge may be secured from the patients that have nocturnal emissions—not uncommon with patients of this class—or by any means that may be available.

(b) Or the prostate glands and seminal vesicles may be subjected to digital massage, through the rectum, after which the discharge thus expressed from them may be recovered from the next urine voided, or some of the discharge may appear at the orifice of the urethra at the time of examination, when a slide or slides may be prepared for microscopic examination.

The subsequent manipulations are of a highly technical character, familiar only to physicians trained in laboratory methods, and require no further mention in this connection. My only apology for giving the details already enumerated is found in my desire to enable the lay reader to know when he has and when he has not been really examined and when he has or has not received an opinion that is worthy of a moment's consideration.

Marriage should be prohibited:

(1) *In all cases in which gonococci can be demonstrated.*

(2) *In all cases in which gonococci cannot be demonstrated, but in which there occur shreds or any perceptible discharge from the urethra, following a known attack of gonorrhoea.*

(3) *In all cases, even when gonococci are absent, but in which at least two years have not elapsed since the disappearance of all active symptoms of the disease.*

(4) *The interdiction of marriage should not be removed until the absence of gonococci has been demonstrated by repeated examinations—not less than four—at intervals of about two weeks.*

(5) *In all cases in which no existing infection can be demonstrated, but in which sterility has resulted from gonorrhoeal infection of both testicles, the ground for interdiction being the sterility and not the danger of communicating the infection.*

(b) Gonorrhoea in Women.

Gonorrhoeal infection in women is generally first manifested by a copious yellowish, creamy discharge, associated with irritation amounting in some cases to intense burning about the urinary orifice. The burning pain on urination may or may not subside under treatment within from a few days to a couple of weeks. The discharge, however, is generally more persistent, keeping up in spite of all usual efforts at cleanliness. After a period varying from ten days to three weeks, both symptoms, if left to themselves, begin to decline. The pain may entirely

disappear, but the discharge is liable to persist for a much longer period. Of course, under treatment by any competent physician, this stage of the disease is always cut short. The importance of prompt application for treatment is shown by what is liable to happen by the farther natural development of the disease.

One peculiar faculty of the *gonococcus* is continuously to invade adjacent internal membranes. This means that it spreads upward much as fire spreads through dead grass. When the entire lining membrane of the vagina has become infected, the discharge is at its maximum. After a while, the covering layer of the vaginal membrane is more or less completely destroyed on the edges of its many folds, causing a sense of soreness, sometimes associated with slight bleeding. The infection now dips down between the folds, where it becomes deep-seated, and more or less permanent. This is a fact of extreme importance.

If the disease continues to extend upward, as it does in a large number of cases, the lining membrane of the womb is next invaded. If a patient in this stage is examined by means of a speculum, a thick, yellowish, creamy discharge is seen coming from the mouth of the womb, sometimes mixed with large quantities of mucus that looks like the white of an egg. This infection of the uterus may or may not be painful.

The next upward extension of the infection is to one or both Fallopian tubes, the two little canals,

one upon each side, that convey the ovule, the little egg or germinal element of the female, from the ovaries to the womb. The moment that gonorrhoeal infection becomes active on the inside of the Fallopian tube, that moment the uterine end of the tube becomes closed and can no longer serve as a duct through which the ovule can pass. As the disease advances out through the tube, it causes the formation of pus, which, unable to drain out through the womb, must escape through the other end of the tube into the general cavity of the body. When this happens, inflammation of the lining membrane of the body—the peritoneum—occurs, a condition usually spoken of as peritonitis. To prevent this dreadful calamity, nature seems to act with all haste to close the outer end of the tube just as it had previously closed the end next to the womb. This converts the tube into a sac with both ends closed and with the pus continuing to accumulate in its interior—a condition generally spoken of as "pus tubes."

In consequence of the intense inflammation and swelling of the walls of the tubes, and in consequence of the distention due to the pressure of the accumulating pus on the inside, this condition becomes extremely painful. The pain may be located upon one or both sides of the lower part of the body, according as one or both tubes may be involved,—remembering always that one tube may be involved at one time and the other one later. This condition is associated with one or more chills fol-

lowed by fever, which may go as high as 104° F., with occasional clammy sweats. When the disease has reached this stage—the stage of blood-poisoning—it is possible for enough of the virus to be absorbed into the circulation to cause death. In certain cases, the pressure of the accumulating pus may cause the tube to burst. This may occur at either end or through the wall. When it occurs at the outer end or through the wall, the pus generally escapes into the cavity of the body, causing inflammation of the peritoneum or inflammation of the ovaries, or both. When it occurs at the inner end of the tube, the pus may drain through the womb, thus establishing a perpetual fountain-head of infection for the womb and vagina. In any of these three forms of escape, it is to be remembered that, unless surgically restored, the tube can never again serve as an oviduct or, in other words, if both tubes are involved, the woman has been made sterile.

When the infection extends out beyond the tube, either before it has become seated or later by rupture, the surfaces of the ovary become infected and inflamed. This is probably the most agonizing affliction that can befall a woman. The pain during the acute stage often defies opiates and nothing but an anesthetic can relieve the victim's cries for relief. In addition to the agonizing pain, fleeting chills followed by high temperature and sweats characterize this phase of the disease. As a result of the inflammation, a varnish-like coating forms on the surface of the ovary, causing it to grow fast

to neighboring structures (adhesions). Or, where the ovary does not grow fast, this varnish-like coating becomes a firm, inelastic membrane. This inelastic membrane does not permit the ovary to expand as it should normally preceding menstruation, which, as a result, becomes a most painful function. The formation of this membrane is, however, a most important fact from the eugenic or, rather the agenic point of view, for, with or without associated adhesions, it prevents the escape of the ovule—or microscopic egg—from the ovary and thus becomes an additional cause of sterility.

Much more could be written about gonorrhoea in women, its extension through the urethra and bladder to the kidneys, its involvement of the glands, and its rheumatic manifestations in the chronic forms, but enough has been depicted to show its relationship to the great function of human production. This relationship can possibly be made clearer and more easily comprehended by a brief recapitulation of the following points, viz.:

(1) Gonorrhoeal infection may become deep-seated in the folds of the vagina, or in the neighboring glands, whence, for an indefinite period, it may be communicated to man in the act of intercourse, or to the eyes of infants in the act of parturition.

(2) Gonorrhoeal infection of the uterus may become chronic and consequently the cause of sterility, either by preventing conception, or by causing the early death of the embryo.

(3) Gonorrhoeal infection of the Fallopian tubes is an inevitable cause of sterility, a frequent, persistent fountain-head of the disease, and the cause of permanent invalidism.

(4) Gonorrhoeal infection of the ovaries by destroying the function of ovulation is also a cause of sterility and, by interfering with menstruation, becomes a cause of persistent ill health.

(5) No woman who has been the victim of gonorrhoeal infection is justified in marrying under two years after the active symptoms have ceased, and not then unless the *gonococcus* infection has been demonstrated by careful and repeated microscopic examination to be absent from the secretions.

Examination to determine the presence or absence of latent or chronic gonorrhoeal infection in women.

The examination of women for latent gonorrhoea must be undertaken with due regard to the duration of the disease, its anatomical extension, and its various known lurking places.

(1) The urethra should be examined by inspection of its orifice and by the attempt to express from Skene's ducts the drop or two of infectious pus that each often contains in these cases. A catheter or other instrument ought never to be carried into the bladder unless the latter is known already to be infected.

(2) The condition of Bartholin's glands should be carefully noted and the attempt made to express

any secretion that they may contain. The secretion thus obtained should be examined microscopically.

(3) The mouth of the womb and the canal in the neck of the womb should be carefully examined, and some of the secretions secured.

(4) In the event that persistent discharge comes down from the cavity of the womb, some of it should be secured from high up and subjected to the usual laboratory tests.

(5) When the Fallopian tubes are suspected of involvement, they may be very gently compressed by bimanual examination to determine whether or not some of their possible purulent content can be expressed through the uterus, when some of it should be secured and examined. This manipulation should be undertaken only by one familiar with the parts and the conditions to be dealt with, and with the possible damage to be done by undue pressure. Only in cases of long standing have the uterine orifices of the tubes become sufficiently opened to allow drainage into the uterine cavity.

No examination less comprehensive than that just outlined can be accepted as sufficient upon which to base an opinion as to the presence or absence of latent gonorrhoeal infection. Of course if at any stage of the examination *gonococci* are found, the diagnosis is positive and further investigation, unless conducted with reference to treatment, becomes unnecessary. A negative finding should not be accepted as conclusive, until it has been confirmed by repeated comprehensive examinations.

Marriage should be prohibited:

(1) *In all cases in which gonococci are demonstrated to be present in any of the secretions or structures that have been indicated.*

(2) *In all cases in which gonococci cannot be demonstrated, but in which muco-purulent secretions persist following known previous gonorrhoeal* infection.

(3) *In all cases in which less than two years have elapsed since the disappearance of the last active symptom.*

(4) *In all cases in which absence of infection has not been demonstrated by at least four comprehensive examinations at intervals of not less than two weeks.*

(5) *When gonorrhoea has caused sterility.*

(c) *Gonorrhoea in Infants and Children.*

Gonorrhoea is sure to develop in the eyes of an infant born of a woman who is herself the victim of gonorrhoeal infection. The only prevention of this calamity is in the prompt use of prophylactic measures by the attending physician, practically at the instant when the child is born. If these measures are not used, the next few hours will witness the development of an acute inflammation of the eyes, which become swollen shut and from between the lids of which thick, creamy pus is poured out. The destructive inflammation speedily attacks the tender structure of the eyeball, which may become perforated, causing the contents of the eye itself to

escape, or, in the absence of this calamity, the covering membrane of the eyeball may be destroyed. In either event, hopeless blindness is the result. I am advised by Dr. Stricker, who has had charge of the blind of Cincinnati, and who has made extensive investigation of the subject, that over 25 per cent of all blindness is due to this cause.

New-born infants of gonorrhoeal mothers, if not carefully cleansed and kept clean, may develop the infection in the folds of the skin about the neck, in the groin and in the genital organs.

Children of mature years may be infected from towels, napkins, syringe tips, or other objects which may carry the germs from a parent or other adult, when the disease may develop in the eyes, or more generally about the genital folds. In certain cases of genital gonorrhoea in children, the disease is the result of criminal assault.

Syphilis.

Syphilis is an infectious disease that depends for its existence and perpetuation upon minute organisms known as *spirochaete pallida*.

Syphilis may be (a) local, *i. e.*, restricted to the point of infection; (b) constitutional, involving the entire system; (c) acquired, the result of inoculation with the organism, or it may be (d) inherited by transmission from one or both parents to the offspring.

The *spirochaete* invade the body through some scratch or abrasion where it causes a sore. It then

reaches the blood, where it multiplies and exists for an indefinite period, varying from several months to many years or a lifetime. While in the blood these organisms reach every organ, tissue and structure, in any one of which it may establish diseased changes. It is supposed even to attack the germ-plasm and through that medium to be communicated from one generation to another. This conclusion is denied by some writers, who assert that the disease is communicated with the current of nutrition from the mother of the embryo. This may be true, but if so, it cannot be explained how the disease occurs, as it does occur, in the offspring of a syphilitic father by a non-syphilitic woman. This, however, is a point of but little practical importance in the problem of eugenics, in view of the fact that syphilis exists from birth in many, if not all children born of parents, either or both of whom are syphilitic when the child is conceived. It is a fact which has caused syphilis to be spoken of as "a race poison," one which more than any other is responsible for physical degeneracy as manifested among the races of the world.

Syphilis is classified as a venereal disease because it is generally communicated by sexual intercourse and because the ulcer or sore which marks its invasion generally, but not always, occurs on the genital organs. It should be remembered, however, that any ulcerated area on any surface of a syphilitic subject abounds in the poison with which, on contact, any abraded surface on any non-syphilitic

person may become inoculated. In this way the disease is frequently communicated by kissing. It not infrequently happens that surgeons are contaminated, even with fatal results, while operating on syphilitic subjects.

Acquired Syphilis in Men and Women.

Assuming that the disease has been communicated by sexual intercourse, its first appearance is on some part of the genital organs. A small, hard nodule or pimple begins to appear in from ten to forty days after exposure to the infection. The same sort of pimple occurs at the point of infection on any other part of the body. This pimple, which generally has a bluish appearance and is painless, gradually increases in size for the next few days, after which it begins to break down at its apex. The part thus broken down becomes depressed, leaving a little crater-like center, thus forming a small ulcer. The edges of this ulcer are clearly defined and hard, while the center yields a very slight discharge. The whole ulcerated area moves easily over the soft underlying tissues and feels much like a little piece of parchment imbedded in the surface.

About this time the glands in the groin become enlarged, hard and tender, a condition that may be comparatively slight, or which may go on until the glands break down and form an abcess (bubo).

After from four to six weeks following the first hardening of the glands, an eruption appears on

the skin. This eruption consists of numerous spots, varying in size from a mustard seed to a silver quarter, and rosy in color, from which fact the condition is often spoken of as roseola. A little later, these rose spots become a dull red or brownish color and finally disappear. In their place occur certain copper-colored pimples, from which the skin peals off, leaving a light area around them. They disappear and reappear, each time becoming more and more scaly in appearance. When this process occurs on the scalp, the hair falls out, either generally or in patches. The eyebrows and other hairy areas may be similarly affected.

While this is going on, the skin of the lips and the mucous membrane of the mouth and throat are similarly affected, the eruption here taking the form of mucous patches, often resulting in superficial ulcers, both the patches and the ulcers being virulently contagious. There is some low grade fever, general failing of the health, loss of appetite and flesh. This period may last from six to eighteen months, when all visible symptoms disappear and the patient may think himself well.

This period of apparent recovery may be very brief, lasting for only a few weeks, or it may last for several years. Then, however, occur the changes usually called tertiary. An eruption occurs on the palms of the hands and soles of the feet. Severe eruptions, deep ulcers of the skin and mucous membrane, with hard nodules here and there under the skin, make their appearance. These nodules, called

that the sins of the fathers shall be visited upon the *gummata*, may occur in muscles, bone, the brain, (brain tumors) and spinal cord; in the liver, spleen or kidneys; in the eyes; in fact, in any structure of the body, causing such conditions as rheumatism, deformities, insanity, paralysis, deafness, blindness and either the disturbance or destruction of function of any organ in which they develop. The manifestations of tertiary syphilis are indeed protean and may take more forms than can be considered in this brief sketch, which has been written for a threefold purpose, namely: first, to enable the victim of the disease to recognize it and apply to a reputable physician for treatment at the earliest practicable moment; secondly, that the gravity of the disease may be understood with the hope that its victim may be thereby prompted in all humanity to refrain from communicating it to others, however innocent or guilty of moral obliquity; and, third, that due precaution be taken not to transmit the disease to the innocent unborn. The gravity of this last consideration from the eugenic, or, more properly, the agenic standpoint, is so great that I cannot dismiss it without further consideration.

Inherited Syphilis.

Unfortunately, syphilis but rarely destroys the power of reproduction, and still more unfortunately, the offspring of a syphilitic parent or parents inherits the malady. This conspicuously is the disease alluded to in the Bible, when it was declared

children, even to the third and the fourth generation.

If either parent is actively syphilitic at the time the child is conceived, abortion at the fifth or sixth month is very likely to ensue. If, however, the pregnancy goes to full term, the offspring may or may not show active manifestations of the disease at birth. When the manifestations are active, they generally take the form of a distinctly syphilitic eruption. Such children usually die within the first few weeks after birth.

If it shows no symptoms at birth, it may go from two to six weeks before any manifestations occur. It then loses its healthy appearance and begins to snuffle; is fretful and falls off in flesh. The skin becomes dull, loose, dry and wrinkled, is very brittle and cracks around the mouth and nostrils, the fissures thus forming later healing by the formation of tell-tale scars which last during life. These cracks about the mouth are contagious and may infect the nipple of the mother who escaped the infection during pregnancy. The bones, especially those of the head, face and extremities, are liable to show increasing deformity. As a result in later life, the forehead is liable to be prominent, the bridge of the nose sunken and the legs bowed. The child is liable to be stunted, ill-nourished and of low vitality. The skin later becomes greasy, earthy-looking, and disfigured with scars from previous ulcerations. The teeth, especially the upper incisors, are conical or "pegged," and sometimes notched at their free bor-

der. There is generally a tendency to sore eyes and the formation of ulcers on the surface of the eyeball, resulting in impairment of vision and, in many cases, the loss of sight. One-half of the blindness in the asylums for the blind is of syphilitic origin. Deafness is a common complication. The bones of the nose and palate are liable to become diseased. The bones of the hands, wrists, feet and ankles are liable to distortion. There is a persistent tendency to ulceration of the throat and soft palate. In later life, about the period of puberty and adolescence, the internal organs may become affected as in acquired syphilis of adults, a development of the disease that is generally fatal in children. This form of the malady, according to Mr. Hutchinson, the great authority on syphilis, may be the first manifestation of the inherited disease.

The victims of inherited syphilis beget offspring of the syphilitic type, or syphilitic degenerates, in which, however, the disease is liable to be much less active. They, however, are marked variants from the normal type and are prone to breed more or less true to their variation.

The lesson to be drawn from this brief survey of syphilis, viewed from the eugenic standpoint, may be succinctly stated as follows:

(1) *Syphilis is a contagious disease that may be either acquired or inherited.*

(2) *As long as the organism (spirochaetae pallida) exists in the system, syphilis may be communicated.*

(3) *Acquired syphilis may, although unfortunately but seldom, destroy the power of reproduction.*

(4) *Either parent may transmit the disease to the offspring without the other parent acquiring it.*

(5) *The progeny of syphilitic parentage is a less fit progeny with a tendency to progressive degeneration.*

DIVISION III.
Applied Eugenics

CHAPTER XII.

The Eugenic Medical Examination.

The application of eugenic principles must always relate primarily to (a) the fitness or unfitness of the individual to marry anybody, and to (b) the fitness or unfitness of a given two persons to marry each other. Many of the facts involving the application of these principles are so apparent that they can be detected and appreciated by any person of ordinary intelligence. Thus, no person would require, or at least should require, advice against marrying a confirmed epileptic, a cretin, a feeble-minded person or one afflicted with insanity, the marriage of which is, indeed, generally prohibited by law. Nor would anybody wittingly marry the victim of communicable gonorrhoea or syphilis, the existence of which may, however, be either designedly or undesignedly concealed.

It is precisely to guard against such conditions as those last mentioned and to guard against such other agenic states as certain sexual and bodily malformations and against the transmission of certain character units and diseases, at once obscure and undesirable, that the advice of a careful and competent physician, one thoroughly imbued with a sense of the responsibility thus incurred, and with the technical training to meet such responsibility,

should be sought and followed by those contemplating marriage.

It is not intended here to discuss the technical details of the eugenic examination. Such details belong to the professional training of the physician, to whom alone their application should be entrusted. It is, however, here intended so far to indicate the character and scope of the examination that those who seek its protecting influence may know when they have and when they have not received attention upon which they may, with confidence, repose their future happiness and welfare.

It should be understood, in the first place, that the necessity for the eugenic examination may apply with just as much force to one sex as to the other. It should be understood, furthermore, that the value of the eugenic examination must necessarily depend upon not only the truthfulness, but upon the fulness and frankness of answers to the necessary interrogatories. Every fact, whether pleasant or unpleasant, should be laid openly before the consultant.

The scope of the inquiry will necessarily vary with the circumstances of each case. It ought, however, in every instance, to be sufficiently comprehensive and sufficiently detailed to furnish a rational basis for advice. The information ought to be carefully recorded, and when based upon the statement of the person examined, that fact ought, in justice to the physician, to be indicated on the record. The original record should be given to the person ex-

amined and the duplicate should be filed by the examining physician.

The examination should be somewhat different for men and for women, and should be (a) verbal and (b) physical, about as follows:

GENERAL VERBAL EXAMINATION.

Personal: After recording the name, sex and age of the individual, inquiry should be made as to the date and incidents of puberty. Previous diseases to which the individual has been subjected should be recorded with the dates of each. Special and direct inquiry should be made with reference to the previous occurrence in the individual of such maladies as mumps, gonorrhoea, syphilis, tuberculosis, cancer, epilepsy, alcoholism and insanity.

In the instance of women, especially of young women, these inquiries can and should be made, at least primarily, by asking about the symptoms. The answers to these questions as well as the general circumstances of the case will enable the consultant to determine just how far and in what manner to extend the enquiry.

The nature and significance of all relevent conditions should be enquired into. All the bodily functions, including the special senses, should be the subject of enquiry. Bodily development, including deformities, should be made a matter of investigation. The educational record and mental habits should not be overlooked. Occupation, together

with business or industrial habits, have an important bearing. It is, however, of even more importance to take into account the pleasures, sports and pastimes, which should be carefully enquired into. What a man does when he is at work is often of vastly less eugenic importance that what he does when he is not at work. Avocation, quite as much as vocation, should, therefore, be made the subject of enquiry.

Ancestral: Questions covering about the same points, but applying especially to character units, should be asked with respect to each of the two parents, and each of the four grandparents. A record should be made of each fact having the least hereditary significance, even when occurring in remoter ancestors.

Collateral: To determine the significance of an hereditary factor occurring in an ancestor, it is often of the highest importance to enquire relative to the occurrence or non-occurrence of such a factor in all the descendants of such ancestor.

PHYSICAL EXAMINATION IN MEN.

The scope of the physical examination in both men and women will naturally be determined largely by replies to the preliminary question. It would, for example, be absurd to examine the chest of a well-nourished, well-developed person who gave no history whatever pointing to anything wrong in either the lungs or heart. Every man, however, who gives the history of mumps, should have the geni-

talia examined to determine whether or not he is the victim of sterility due to atrophy of the testicles. (See "Mumps.") Every man who gives the history of a gonorrhoeal attack, recent or remote, should be subjected to a rigid physical examination to determine whether or not he is still the possible source of infection. (See Chapter on "Gonorrhoea.") In view of the fact that numerous deformities and malformations, including immature development, may exist without the individual knowing them to be such, and without knowing their significance, it is important that the genital organs of men should be examined in each instance. In cases of syphilis, either acknowledged or obvious, personal or ancestral, the most rigid examination should be made by the methods elsewhere indicated. (See Chapter on "Syphilis.")

Physical Examination of Women.

It should be stated at the very outset that, in the absence of positive indications, no physical examination of the genital organs ought ever be either attempted or suggested in the case of young women. Thus, in the presence of normal menstruation and in the absence of symptoms pointing to disease of either the uterus or ovaries or both, the existence of sexual efficiency is an entirely safe assumption. If, however, there is a complete absence of menstruation, or if that function was tardy in appearance and scanty and painful in its later manifestation,

the possibility of undeveloped or infantile uterus becomes a matter for physical determination. Such an examination ought generally to be made under anesthesia. The same character of investigation under the same precautions ought to be made when there is anything in the history pointing to possible malformations of the genital or urinary organs. Deformities of the bony pelvis have a close relation to child-bearing possibilities and should, therefore, be investigated with accuracy. In women who have been married or in whom there is any possibility of gonorrhoeal infection, recent or remote, a careful examination of all the genital organs should be made in accordance with the rules given on another page. (See Chapter on "Gonorrhoea in Women.") Cutaneous eruptions occuring on any part of the body should be inspected with reference to determining their possible specific character. (See Chapter on "Syphilis.") All other physical conditions, especially those of possible agenic significance, should be made the object of careful and direct investigation.

The results of the examination, verbal and physical, may, in certain measure, be interpreted in the light of the genetic factors which comprise the subject matter of the next chapter.

CHAPTER XIII.

GENETIC FACTORS.

It has been made obvious in preceding chapters that many conditions influence the perpetuation of human life and thus promote, embarrass or defeat the genetic purpose of marriage. These conditions may be roughly classified as follows:

(1) Character units which may be either agenic or eugenic in their values, or which may have none other than a mere genetic significance.

(2) Malformations and deformities, which while not transmissible from one generation to another, may so affect the individual as to be either destructive of sexual efficiency, or as to render reproduction hazardous. Such malformations and deformities are, therefore, to be classified as agenic.

(3) Diseases which may (a) destroy the germplasm and thus render the individual sterile; (b) destroy the functional power of various reproductive organs; (c) endanger the health and life of an innocent party to the marital relation; or (d) effect the degeneracy of offspring.

While these various factors may be grouped and discussed under this classification, it is probably better for convenience of reference in a scheme of applied eugenics to present them in alphabetic order as follows:

ALBINISM—(See "Skin, color of.")

ALCOHOLISM—*Degeneration index; agenic.* Alcoholism is here used to imply the chronic habituation of the system to alcohol in some or any of its various forms, as distinguished from acute, transient or incidental alcoholic intoxication. The demand of the system for the occasional drink of an alcoholic beverage is simply the demand for a stimulant with which to overcome some real or fancied exhaustion. The persistent demand for alcohol is generally the demand of the system for something with which to make up for some equally persistent defect. In other words, alcoholism is the sign and index of some form of degeneration.

From the genetic viewpoint, alcoholism, *per se*, is not to be recognized as an hereditary or transmissible trait. In other words, it is not a character unit. But the degeneration of which alcoholism is only one manifestation is an hereditary factor of distinct agenic significance. The transmission of this degeneracy cannot, in our present state of knowledge, be expressed in definite terms, if for no other reason than that it is variously manifested in the progeny. Thus the degeneracy that finds expression in alcoholism in one generation may be manifested in the next in the form of epilepsy, feeble-mindedness, insanity, immorality or criminality.

Degeneracy, of which alcoholism is one expression, may occur in men or women; in the married, or

single; in the young, or the aged; in the rich, or the poor.

Unfortunately, alcoholism does not seem to lessen the fecundity of its victims. The quality of their progeny is, however, progressively lowered. This is due to the combined influence of transmitted degeneracy and the pernicious effect of environment. The child born of a drunken mother is a nine-months old drunkard on the day of its birth. The influence of persistent alcoholization of the unborn child, through the alcoholization of the maternal blood current, accentuates the germinal tendency to physical, moral and mental degeneracy.[1]

As a genetic factor, alcoholism, considered in its immediate relation to the marriage state, may be summarized as follows:

(1) The chronic alcoholist generally develops lowered sexual efficiency.

(2) General failure of sexual power, associated with strong desire, generally manifested by alcoholics, often results in sexual "promiscuity," associated with perversion.

(3) Progressive alcoholism destroys the normal psychic type and thus breaks up family ties.

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[1] A woman drunkard who died early in the nineteenth century was the direct ancestor of 834 persons, of whom there were 700 records. Of these, 157 were illegitimate, 162 were mendicants, 64 were paupers, 181 were prostitutes, 7 were convicted murderers, and 76 were convicted of lesser crimes. (Mott, Lancet, May 6, 1911, p. 1251. See also the "Jukes Family," p. 17.)

(4) Lowered general efficiency of alcoholists tends to pauperism and crime.

(5) Lowered general resistence of alcoholists makes them the easier prey of infections and shortens their expectancy of life.

(6) Alcoholism is a germinal defect, the degeneracy underlying which is transmitted in some form to 100 per cent. of the progeny of two alcoholic parents.

Marriage with or between degenerates of the alcoholic type is advised against and should be prohibited by law.

ANEMIA—*Blood disease; agenic.* Is a word that implies "bloodlessness" which does not occur. It is used to designate certain impoverished states of the blood. One state is called chlorosis and is characterized by diminished coloring matter of the blood. Another state is called progressive pernicious anemia, and is characterized by a rapid multiplication of the white cells of the blood. Both have been suspected of hereditary influence, but the evidence is inconclusive. Habitual anemics are less efficient than normal when considered as parents. In this sense anemia is agenic.

ART—*Aptitude for; character unit; eugenic.* The hereditary transmission of aptitude for art production is based upon rather more than presumptive evidence.

(1) When both parents have highly artistic ability, the progeny will have artistic ability.

(2) When one parent has artistic ability and the other is without both artistic ability and artistic ancestry, the children will probably be without artistic talent. "But, if the unartistic parents have artistic ancestry, there will be artistic children."

ARTERIOSCLEROSIS—*Disease; agenic.* This condition characterized by hardening of the arteries is the chief underlying cause of apoplexy. It has been claimed by some observers that arteriosclerosis, as well as lack of resistence in the unhardened walls of the arteries, has an hereditary basis. Some evidence, although insufficient, has been adduced. The disease is essentially one of advanced life, but it may occur at any age, even during infancy. Marriage should be advised against in any developed case of arteriosclerosis, as tending to hasten a fatal issue.

ASTIGMATISM—*Ocular defect, hereditary, genetic.* This defect of vision depends upon abnormal shape of the lens. The terms of its transmittal have not been defined. It is not sex limited. It may become recessive in either sex of an otherwise affected fraternity. Normal parents, both having astigmatic antecedents, and belonging to an otherwise affected fraternity, will have astigmatic children. As it has no antagonistic influence to life and as, in this spectacle age, it has but little or no power to lessen efficiency, it is to be regarded as genetic rather than agenic or, much less, eugenic.

ATAXY—*Disease; agenic.* Locomotor ataxy is a degenerative disease of the spinal cord, resulting, in the majority of instances, from syphilitic infection, usually acquired by the patient. Friedrich has, however, described a form of ataxy characterized by progressive loss of power to direct the movements of the legs and arms, followed later by feebleness and even loss of speech, and still later by distortions of the spine. There have been some analyses of pedigrees, notably by Mott, indicating that this degenerative process in the upper part of the spinal cord may be hereditary. Normal individuals of atactic strain should be careful to avoid marriage into a similar strain. Davenport urges caution in advising the marriage of any atactic person.

BLADDER—*Malformations of.* (See "Malformations.")

"BLEEDERS"—(See "Hemophilia.")

CANCER—*Malignant disease; agenic.* Occuring in middle and advanced life. The facts that have a bearing on the question of the hereditary transmission of cancer are not only in a state of confusion, but are not susceptible of intelligent interpretation for a number of reasons. Lucas,[1] after a careful review of the question, asserts the fact that cancer is more frequent in families without history of cancer than in those families in which there is a history of the disease, is conclusive against

[1] London Medical Press and Circular, Vol. 143, 1911, p. 631.

the assumption that it is hereditary. The cause and, therefore, the essential nature of cancer is not known. The observed and collated facts, both with respect to the occurrence of the disease and the nature and progress of the tissue change that it causes, seem to suggest that it is produced by an organism; that is to say, that it is infectious, although the organism has not yet been isolated. On the other hand, certain facts seem to suggest that it is hereditary; but when these facts are analyzed, they seem to fit the infection theory quite as much as the hereditary theory. Thus it is found that cancer persists irregularly through certain members of successive generations, but this fact is offset in its hereditary significance, by the additional fact that, in the majority of instances, such cancerous generations, at least during early life, have been subjected to the same environmental influence as their parents. There are such things as "cancer houses," *i. e.*, habitations succeeding occupants of which, whether related to each other or not, have developed the disease. Mice and other rodents infesting such houses have cancer. Trout, bred in hatcheries and fed while there upon cancerous liver from the abattoirs, develop cancer. These and other similarly significant facts that have been marshaled by Gaylord point to infection rather than heredity as the efficient factor in causation. In the meantime, the question must be recognized as open, awaiting the further development of facts. Whether infectious or hereditary, cancer, especially when it prevails in

a large proportion of any generation or of several generations of the same family, must be recognized as essentially agenic in a racial sense, and, therefore, constituting a dangerous matrimonial risk.

CHLOROSIS—*Disease; agenic.* A form of anemia occurring chiefly in women. Certain observations have been made tending to show that the condition is hereditary, but the evidence is far from conclusive. (See "Anemia.") In the sense that chlorotic subjects, persistently the victim of the disease, are but illy fitted to meet the responsibility of parenthood, the condition must be classed as agenic.

CHOREA—*Functional nervous disease; agenic.* This disease, often called St. Vitus's dance, is characterized by involuntary and sometimes spasmodically irregular movements of the voluntary muscles of the legs, arms, face and other parts of the body. It is generally the index of a relatively low power of nervous resistance. The disease occurs in two types, *viz.:* (a) ephemeral and (b) progressive. (a) Ephemeral chorea generally occurs in young subjects and, under favorable circumstances, tends to recovery. It has no genetic significance, except as an index of a relatively inefficient nerve type. It is a disease of childhood and tends to recovery. (b) Progressive chorea, often called Huntington's chorea, occurs in middle or later life and terminates in dementia and death. Jelliffe and Hamilton have charted pedigrees of this form of

chorea. Normal members of progressive choreic families do not transmit the trait. They ought, however, to marry outside the strain. Persons with progressive chorea, should never become parents.

CLEFT PALATE—*Embryonal defect.* This condition is the result of the failure of the embryonal structures to blend in the formation of some part of the roof of the mouth. It generally occurs in connection with harelip. (See "Harelip.") There is some evidence that cleft palate may be hereditary but it is far from conclusive. No eugenic rules can be formulated.

COLOR BLINDNESS—The inability to distinguish certain colors is known to "run in families." The defect applies to red and green more frequently than to other colors. It is more common in men than women, the ratio being about 4 per cent. males to 0.5 per cent. females. Pedigrees so far studied seem to warrant Davenport's conclusion that "while color-blind males will have no color-blind sons and, typically, no color-blind offspring of either sex, yet their daughters married to men of normal stock, will have color-blind sons."

Daughters may inherit color blindness from their fathers.

CONSUMPTION—(See "Tuberculosis.")

CRETINISM—*Character unit; agenic.* This condition, generally classified as a disease, is a vice of development in which stunted growth, undeveloped

genitalia, scant but coarse hair on the scalp, coarse skin, defective teeth, pendulous abdomen are leading characteristics. The thyroid gland is always either rudimentary or absent, and when present, is liable to be the seat of cystic degeneration (goitre). The intelligence verges from feeble-mindedness to idiocy.

(1) When a cretin marries a non-cretin, the children tend to be half cretins and half non-cretins, with general preponderance of feeble-mindedness.

(2) When a cretin marries a cretin, all the children are cretins.

(3) When a cretin, born of a cretin and a non-cretin, marries a non-cretin, cretinism in their children tends to become dominant in the ratio of 3 to 1; in other words, cretinism tends to prepotency.

It is for this reason that the marriage of cretins is interdicted by all really civilized countries. The enforcement of this law by means of rigid segregation has caused the once numerous cretin colony of Aosta, Italy, to become practically extinct.

CRIMINALITY—*Degeneration index; agenic.* The tendency to crime, so far as it is not dependent upon environment, *i. e.*, which is hereditary, is generally associated, if not in the individual, at least in the fraternity of the individual, with the dominance of certain recognized traits, such as a low order of intellect, feeble-mindedness, epilepsy and alcoholism, each of which is to be recognized as an evidence of degeneracy. Marriage should be avoided with members of a criminal fraternity or with persons of

criminal ancestry. Marriage between persons of criminal tendencies, especially between habitual criminals of any class, should be interdicted by law and the possibility of reproduction averted by sterilization.

Degeneracy—*Character complex; agenic.* Degeneracy is a term used to express a constitutional state which, with reference to one or more or all of its constituent traits, is below the norma of the race and which generally manifests a tendency to further decline of standard. The manifestation of degeneracy may be as various as the traits involved. A poor general physique, defective physical traits, deficient energy, alcoholism, low mentality, epilepsy, pauperism, moral depravity and sexual perversions are examples of an underlying degeneracy. Certain manifestations of degeneracy are demonstrated character units with definite terms of hereditary transmission, while degeneracy manifested in one form, not a character unit in one generation, may be manifested in another form, not a character unit in the next generation. Degeneracy is, therefore, treated under the head of the various agenic factors.

Deaf Mutism—*Auditory defect; hereditary; agenic.* This form of deafness either exists at birth, or develops before the power of speech. As the evidence now stands, the following conclusions seem justified, *viz.:*

(1) When both parents are deaf mutes, one-fourth of them—25 per cent.—have some deaf children.

(2) Of deaf mutes that have deaf mute children, the ratio of the latter to normal children by the same parents is as 1 to 3.

(3) When deaf mutes of the same deaf mute strain marry, 45 per cent. of such marriages yield deaf mute offspring in the ratio of 3 deaf mutes to 7 normals.

(4) When deaf mute parents are cousins, 25 per cent. of their offspring are deaf mutes.

(5) When deaf mute parents are not blood relatives, about 6.8 per cent. of their offspring are deaf mutes.

(6) When one parent is a deaf mute and the other normal, with normal family relations, the children are generally normal.

(7) In fraternities in which one parent is a deaf mute and the other normal but has deaf relatives, 35 per cent. of such fraternities contain deaf mutes.

(8) When both parents are normal but both belong to deaf mute strains, the resulting ratio of deaf mute children is high.

(9) Acquired deafness is not hereditary.

EARS—*Roaring in.* This malady, known as Meniere's disease, is characterized by persistent and often intense ringing in the ears. The presumption that it is hereditary is so far based upon the report of a single family in which the father, one

son and two daughters had the disease. Further investigation is required to justify its classification as an hereditary trait.

EPISTAXIS—*Disease; agenic.* This malady is characterized by a tendency to frequent, persistent, severe and even fatal bleeding from the nose. It occurs most frequently during adolescence, but may occur at any period. A number of observations suggest an hereditary factor, but the collected facts do not justify general conclusions, much less an attempt definitely to express the terms of transmission. (See "Anemia" and "Hemophilia.")

EPILEPSY—*Character unit; agenic.* This is a disorder of the nervous system characterized by convulsions, or "fits." It may amount to only a slight convulsive twitch (*petit mal*), or the patient may fall in the midst of writhing contractions of the entire muscular system (*grand mal*). In both varieties, the essential feature of the disease is unconsciousness, which may last from only one or two seconds, to several minutes, or even longer. The disease is an evidence of degeneracy which may manifest itself in succeeding generations by "alcoholism," "feeble-mindedness," (see "Mentality"), "insanity," "narcotism," or other nervous troubles. The law governing the transmission of epilepsy, or the epileptic taint, confirmed by extensive research, is as follows:

(1) When both parents are epileptic and of epileptic ancestors, all their children will be epileptic.

(2) When one parent is epileptic and the other is normal, on the average half the children will be epileptic and half will be normal.

(3) When both parents are apparently normal, but one grandparent has epilepsy, the children will tend to be 3 normal to 1 epileptic.

(4) In breeding, marriage of cousins or other blood relations tends to intensify the epileptic taint.

EXOPHTHALMOS—*Disease; hereditary; agenic.* This condition, ordinarily spoken of as exophthalmic goitre, is characterized by enlargement of the thyroid gland, and by prominence amounting to actual protrusion of the eyeballs. It is restricted almost entirely to females, although a few cases among males have been noted. It is frequently associated with epilepsy. While the hereditary character of the disease is beyond question, the pedigrees so far analyzed are too few to justify a definite statement of the terms of transmittal. Children of exophthalmic ancestries, particularly in the first and second preceding generations, are not good matrimonial risks. (See "Goitre.")

ENERGY—*Character unit; eugenic.* General physical energy is recognized by students of heredity as a transmissible trait. Pedigrees, so far analyzed, justify the following conclusions:

(1) Parents of high bodily energy have a progeny that ranges from medium to high.

(2) Parents of low bodily energy and belonging to a family of low bodily energy, have a progeny that ranges from medium to low energy.

(3) When one parent has high energy and the other low, and of low energy ancestors, the children will range from medium to low energy.

(4) When one parent is high and the other is low but having a high energy ancestor, the children will be about 50 per cent. high and about 50 per cent. from medium to low energy.

Eyes—*Color of; character unit; pigmented, eugenic; non-pigmented, agenic.* By the color of the eye is meant the color of the iris or ring that surrounds the pupil.

Blue eyes depend for their color upon the absence of pigment in the iris, which, in these cases, is almost transparent, and through which the underlying clear structures produce a blue effect. Blue eyes in later life are prone to become gray, owing to the increasing density of the muscular fibres of the iris. In certain cases, they become pigmented.

All other colors of the eye depend upon the deposit of pigment in the iris.

Galton followed by Hirsch, Davenport, Holmes and Lewis, have studied the hereditary transmissibility of eye color with the following generalization of results:

(1) Eye color shows no tendency to blend in heredity.

(2) Both parents having pure blue eyes, all their children will have pure blue eyes.

(3) When one parent has blue eyes and the other some "other-colored" eyes, the children will either all have "other-colored" eyes or, on the average, out of every 100 children, 52 will have blue eyes and 48 will have "other-colored" eyes.

(4) When both parents are brown-eyed, either all the children will be brown-eyed, or, if there is any deviation from this rule, 75 per cent. will be brown-eyed and 25 per cent. will be blue-eyed.

FALLOPIAN TUBES—*Malformations of.* (See "Malformations.")

FITS—(See "Epilepsy.")

GOITRE—*Disease; agenic.* This disease affects the thyroid gland. Its frequent persistent occurrence in successive generations of the same family, notably observed in Switzerland, is probably explainable on the theory of infection from environment, rather than on that of heredity. (See "Exophthalmos.") The infectious element has not, however, been isolated. The condition is inimical to parental efficiency and is, therefore, agenic.

GONORRHOEA—(See Chapter on "Race Poisons.")

GOUT—*Disease; non-hereditary; agenic.* This disease has generally been looked upon as hereditary. This view is probably erroneous. Gout is caused by errors in the waste and repair of tissue, and in the

elimination of the products of that process. It is, therefore, somatic and not germinal.[1] The fact that it is sometimes occurs in the children of gouty subjects simply suggests that the children are probably subjected to the same nutritional and environmental influences as their parents.

Hair—*Color of; character unit.* The color of hair is determined by the color of the pigment in the hair. The standard colors are (a) black, (b) brown, (c) tow, (d) yellow, (e) red, and (f) grey, due to the failure of the hair follicle longer to furnish pigment. There are various shades between these standards. Of these, only red hair has any eugenic significance, and this arises, according to Davenport, from the reputed antipathy of red-headed people for red-headed people of the other sex. Hair color is not a Mendelian unit and the study of its transmission has resulted in only a few tentative generalizations, *e. g.:*

(1) Children do not develop hair darker than the darker parent, *i. e.*, dark-haired children are probably never bred from flaxen-haired parents.

(2) (a) Red-haired parents beget red-haired children; (b) red-haired children may come from glossy black hair—the gloss of which being dependent upon the presence of red pigment.

(3) Hair color, recessive in one generation, is liable to become dominant in the next.

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[1] Yves Delage, "L'Hérédité," p. 230.

(4) Light brown bred to light brown yields tow, yellow, golden or red hair.

(4) Slightly brown bred to slightly brown yields half light, half brown.

(6) Brown bred to brown yields (a) all brown, or (b) about 75 per cent. brown to 25 per cent. light, with tendency to all brown on maturity.

HAIR—*Form of; character unit; genetic.* Standard forms of hair are (a) straight, (b) wavy, (c) curly, (d) kinky, (e) woolly. Davenport's generalizations are:

(1) If both parents have had straight hair from childhood, without tendency to curl, all children will have straight hair, exceptions less than 2 per cent.

(2) If one parent has wavy and the other straight hair, half the children will have straight and half curly hair.

(3) If both parents have wavy (simplex) hair, about 75 per cent. of the children will have straight hair.

(4) Two curly-haired parents, both of curly-haired stock on both sides, will probably have 100 per cent. curly or wavy-haired children.

HARELIP—*Embryonal defect; agenic.* This condition consists of failure of some part of the upper lip to form, leaving a notch in the structure. It is generally located in the middle third, although, but rarely, in the middle line of the lip. Harelip is generally associated with cleft palate. (See "Cleft

Palate.") There is some evidence, although inconclusive, that this defect is hereditary and that, as a character unit, it may be recessive in intermediate generations.

HEART—*Organic defects of.* There seems to be no rational ground to doubt that in certain families, organic defects of the heart tend to perpetuation through heredity. Up to the present time, however, analytical studies of pedigrees have not been carried far enough to enable one to state just what form of heart defect will either transmit itself or beget some other form of heart defect. Paternal syphilis and intermarriage seem to tend to the establishment of this germinal defect in given strains. Observation shows that organic heart defects in both parents tend, in certain cases, to beget in offspring other defects with no apparently logical connection with the parental heart condition. In the present state of knowledge, it is well, both from the viewpoint of heredity and that of the welfare of the individuals themselves, that victims of congenital heart defects should not marry.

HEMOPHILIA—*Character unit; agenic.* Characterized by proneness to persistent bleeding that can be controlled only with difficulty or not at all. The essential difficulty is a lack of the fibrinous elements of the blood and the consequent inability to form clots, upon which the spontaneous arrest of hemorrhage depends. The victims of this trait are known as "bleeders." The condition exists almost

but not quite exclusively in males. The hereditary factor in this unusual affection seems to be beyond dispute, although the definite terms of transmission are not yet susceptible of formulation. The following generalizations seem justified:

(1) The disease becomes an active trait (dominant) chiefly, almost exclusively, in males.

(2) It is generally, almost exclusively, an inactive trait (recessive), but is none the less present in female members of hemophilic families.

(3) Hemophilics should not marry.

(4) Male members of hemophilic families who are not themselves hemophilic may safely marry into non-hemophilic families, without fear of transmitting the trait.

(5) The sisters of hemophilics should not marry.

HYMEN—*Malformations of.* (See "Malformations.")

HYSTERIA—*Functional nervous disease; agenic.* This disease is characterized by a more or less temporary loss of control over the thoughts and emotions, and sometimes over the muscular activities. In some cases it is attended with convulsive seizures. It is the index of nervous instability and is consequently sometimes associated with other nervous affections or even those involving the mental and moral faculties. There is no form of functional nervous affection that may not be simulated by hysteria. It is sometimes associated with epilepsy. (See "Epilepsy.") Hysteria, as such, is probably

not transmitted, but that form of degeneration known as the neuropathic type, of which it may be the index, may be transmitted. The question of nerve stamina or the lack of it should always be investigated in hysterical subjects who contemplate marriage. In this connection, it is important to remember that the nerve perturbations of hysteria are liable to result from long repression of the sexual impulse, and that they disappear when normal sexual relations are established. These cases should always be the subject of careful professional investigation by a competent physician.

IMPOTENCY—*sexual disease, functional, agenic.* This disease is characterized by a loss of virile or erectile power on the part of the male. It generally depends upon some condition of the nervous system. In many cases it is caused by mental states, following masturbation of sexual debauchery. It is sometimes permanent. While it lasts, it is the cause of sexual inefficiency.

INSANITY—*Character unit; agenic.* Insanity may be any form of mental disorder that deprives the patient of the power to appreciate or control his normal relation to his environment. It may be divided into (a) functional disturbances known as *exhaustion psychoses*, which are acquired and curable conditions and are not hereditary factors, and into (b) organic defects known as *maniac depressive* states. The latter is a manifestation of nerve-and-brain degeneracy whch may also be manifested by

such conditions as "alcoholism," "narcotism," "epilepsy," "feeble-mindedness," and other so-called "neuropathic states" (q. v.). Generalization drawn from numerous investigations seem to be justified with respect to *maniac depressive* states as follows:

(1) When both parents are insane, all their children tend to become insane.

(2) When one parent is insane and the other normal, half the children tend to be insane and half normal.

(3) When both parents are apparently normal, but one of them has an insane parent, their children will tend to be 3 normal to 1 insane.

(4) When both parents are apparently normal, but both have insane parents, the resulting progeny will tend to be 25 per cent. insane, 25 per cent. "neuropathics" and 50 per cent. normal.

It may be important in this connection to state that Cannon and Rosanoff, (1) after studying the comprehensive pedigrees of 11 patients with a total of 221 offspring, conclude:

(1) When both parents are neuropathic, all children will be neuropathic.

(2) When one parent is normal, but with neuropathic taint from one parent, and the other parent being neuropathic, half the children will be neuropathic and half will be normal, the latter, however, being capable of transmitting the neuropathic make-up to their progeny.

(3) When both parents are normal but each with the neuropathic taint from one parent, one-fourth of the children will be normal and not capable of transmitting the neuropathic taint to their progeny, one-half will be normal but capable of transmitting the taint, and the remaining one-fourth will be neuropathic.

(4) When both parents are normal, one of pure normal ancestry and the other with the neuropathic taint from one parent, all the children will be normal, half of them being capable and half incapable of transmitting the neuropathic make-up to the progeny.

(5) When both parents are normal and of pure normal ancestry, all children will be normal and not capable of transmitting the neuropathic make-up to their progeny.

Law of Anticipation in Insanity.

(1) In hereditary insanity, there is a tendency for the defect to manifest itself at an earlier age in each succeeding generation.

(2) When the defect appears during adolescence, or earlier, it becomes extinct by the arrest of propagation.

LEPROSY—Hansen discovered the *bacillus leprae* in 1871. Lucas failed to trace hereditary histories of the disease in more than 5 or 6 per cent. "Children born of leprous parents are not leprous and, if removed from their parents, seldom become so," is

the statement made by Lucas,[4] who concludes that this "disease has been placed among the ordinary contagious diseases as the result of modern discoveries, and the belief in its hereditary transmission which held sway for tens of centuries has been scattered to the winds."

LITERARY APTITUDE—*Aptitude for; probable character unit; eugenic.* A comprehensive investigation of ancestral influences in many writers justify the statements that:

(1) When both parents have literary ability, about 90 per cent. of the children will have good literary ability.

(2) When both parents are illiterate and have illiterate ancestors, their progeny will be without literary ability.

(3) When literary ability occurs in remoter ancestry of illiterate parents, some of the children of the latter will have literary aptitude.

LONGEVITY—*Eugenic.* Not a character unit, although it depends upon certain character units, such as stature, weight, general harmony of organism, bodily vigor and immunity against infections.

"He comes of a long-lived race" is an expression so frequently heard that it is to be accepted as evidence that longevity is popularly recognized as an hereditary factor. The insurance companies act upon the principle that the risk with long-lived an-

[4] London Medical Press and Circular, Vol. 143, 1911, p. 630.

cestors is a better risk than one with short-lived ancestors. This is justified by the facts which, however, do not include the transmission of longevity as such from one generation to another. They do, however, embrace the transmission of those physical and dynamic qualities that carry with them a high resistance to disease and death-producing influences of environment. The physical and dynamic qualities thus transmitted and that thus have at least a potential eugenic value, comprise the general subject of this volume, and are not, therefore, susceptible of treatment by any categorical expression of law.

(a) B. W. Richardson's Rule for Determining Probable Life Term of Adult Offspring.

(1) Add the ages of both parents and of four grandparents; divide by 6; the quotient will be the required number.

(2) If one or both parents are alive, ascertain the expectancy of each by the same rule, and use the result to compute the expectancy of the adult offspring.

(*b*) *Actuaries' Rule of Expectancy.*

It has been calculated that of 1,000,000 men and women who have passed the age of 30 about one-half live to the age of 63, one-fourth to the age of 76, every tenth to the age of 83 and every hundredth to the age of 97 years. Of 1,000,000

only 100 attain the age of 100, 2 the age of 104, and to find a person only one year older 2,000,000 births have to occur; but only among 10,000,000 human beings, one grows 106 years old.

The following tables show the expectation of life from various ages and the percentage living to the end of certain periods:

American Experience Expectation of Life.

According to the American Experience Table of Mortality.

Age.	No. of years expectation of life.	No. dying of each 1,000 annually.	Age.	No. of years expectation of life.	No. dying of each 1,000 annually.
20	42.20	7.81	58	15.39	22.94
21	41.53	7.85	59	14.74	24.72
22	40.85	7.90	60	14.09	26.69
23	40.17	7.95	61	13.47	28.88
24	39.49	8.01	62	12.86	31.29
25	38.81	8.07	63	12.26	33.94
26	38.11	8.13	64	11.67	36.87
27	37.43	8.19	65	11.10	40.13
28	36.73	8.27	66	10.54	43.71
29	36.03	8.34	67	10.00	47.65
30	35.33	8.42	68	9.47	52.00
31	34.62	8.51	69	8.97	56.76
32	33.92	8.61	70	8.48	61.99
33	33.21	8.71	71	8.00	67.66
34	32.50	8.83	72	7.55	73.73
35	31.78	8.95	73	7.11	80.18
36	31.07	9.09	74	6.68	87.03
37	30.35	9.24	75	6.27	94.37
38	29.62	9.41	76	5.88	102.31
39	28.90	9.59	77	5.49	111.06
40	28.18	9.79	78	5.11	120.83
41	27.45	10.01	79	4.74	131.73
42	26.72	10.25	80	4.39	144.47
43	25.99	10.52	81	4.05	158.60
44	25.27	10.82	82	3.71	174.30
45	24.54	11.17	83	3.39	191.56
46	23.80	11.56	84	3.08	211.36
47	23.08	12.00	85	2.77	235.55
48	22.36	12.52	86	2.47	265.68
49	21.63	13.10	87	2.18	308.02
50	20.91	13.78	88	1.91	346.69
51	20.20	14.54	89	1.66	395.86
52	19.49	15.39	90	1.42	454.54
53	18.79	16.34	91	1.19	532.46
54	18.09	17.40	92	.98	634.25
55	17.40	18.58	93	.80	734.17
56	16.72	19.88	94	.64	857.14
57	16.05	21.33	95	.50	1,000.00

Symmetry of structure and even balance of function in the human organism tend to the maximum resistance to disease and, consequently to longevity.

Parents having normal symmetry of structure and consequent normal balance of function tend to produce a correspondingly normal and resistant progeny.

Not all deviations from the normal standard are hereditable, those susceptible of classification, as mutilations from accidents of environment, either antenatal or postnatal, being especially exempt from the law governing the transmission of character units.

MALFORMATIONS OF THE BONES—*Agenic.* The bones are often malformed because, during fetal life and early childhood, they contain too little lime and other constituents that make them normally hard. This results in bow-legs, curvature of the spine, distortion of the pelvis and other deformities. Curvature of the spine and distortion of the pelvis are of great agenic significance in women, in whom the power of natural parturition may thereby be destroyed. In such cases, delivery at full term can only be effected by Cæsarean section. In all instances of pelvic deformity in women, the diameters of the pelvis should be carefully determined before marriage by a competent medical man.

MALFORMATIONS OF THE MALE GENERATIVE ORGANS—*Non-hereditary; agenic.* The male generative organs may be so undeveloped or malformed as

to interfere with or even destroy sexual efficiency. In this sense, they are agenic. The chief malformations are the following:

(1) *Epispadias*, a condition in which the urethra has no wall on its superior surface. As a result, the urine and seminal secretions are abnormally discharged.

(2) *Hypospadias*, a condition in which the urethra has no wall on its inferior surface. As a result, the urine and seminal secretions are abnormally discharged.

(3) *Cryptorchid*, a condition in which one or both testicles have failed to descend into the scrotum. Sometimes the undescended organ becomes adherent in the inguinal canal in the abdominal wall; in other cases, it remains free in the abdominal cavity. In either case, unless corrected in early life, the condition results in under-development—with corresponding sterility of the affected organ.

(4) *Infantile genitalia:* In certain instances, there seems to be arrested development of all the genital organs with resulting sexual inefficiency. (See "Law of Sexual Efficiency in the Male.")

(5) *Over-Development* of the external male organs of generation may occur to such an extent as to render sexual intercourse intolerable, if not physically impossible, to normal women.

(6) *Hermaphroditism*, or *Pseudohermaphroditism* is a condition in which genital organs of both sexes occur in the same individual. Complete hermaphrodi-

tism nas never been known to exist. Either the male or the female elements with corresponding secondary sexual characteristics may predominate. These cases are always sterile.

MALFORMATIONS OF THE FEMALE GENERATIVE ORGANS[1]—*Congenital defects; not hereditary; agenic.* The chief malformations of the female generative organs are:

(1) *Absence* or closure (atresia) of the external organs (vulva).

(2) *Adhesion* (or fusion) of the clitoris to the skin, causing local tenderness and sometimes serious nervous symptoms, rendering the marital relation painful and, in certain cases, intolerable.

(3) *Double external organs* (double vulva).

(4) *Undeveloped external organs* (infantile vulva).

(5) *Pseudo-hermaphroditism,* in which certain organs and structures belonging to each sex are present in the same individual.

(6) *Hymen* (malformation)—The hymen is a membranous-like structure which, normally, but partially closes the vagina at its outlet. In some cases, this slight and fragile membrane is a dense cartilaginous ring which renders sexual intercourse impossible (atypical hymen). In other cases, the hymen completely closes the outlet of

[1] Summarized from the author's work on "Disease of Women," D. Appleton & Co., 1913.

the vagina, thus causing retention of the menstrual fluid and other secretions.

(7) *Vagina* (double)—There may be two vaginal canals with a partition between them. The partition may be complete or incomplete. Each canal may or may not communicate with a separate uterus.

(8) *Vagina* (closure)—The vagina may be formed, but its internal surfaces so fused that the canal is practically obliterated (atresia); it may be so narrowed as to prevent sexual intercourse (stenosis); or even the rudimentary structures of the vagina may be absent (absence of the vagina).

(9) *Uterus*—The uterus may be (a) absent, (b) undeveloped (infantile), (c) divided into two cavities (septate), (d) double (duplex), (e) only developed on one side (*u. unicornis*).

(10) *Fallopian Tubes*—The Fallopian tubes may be absent, rudimentary, there may be more than two of them, or they may be congenitally misplaced. *Ovaries*—The ovaries may be absent, rudimentary, or congenitally misplaced.

(11) *Urethra*—The urethra may be entirely absent; its posterior wall may be wholly or partially absent (hypospadias); or its front wall may be absent (epispadias).

(12) *Bladder*—In certain extremely rare cases, the front wall of the bladder, including a corresponding part of the abdominal wall, is absent (extroversion).

MECHANICAL APTITUDE—*Character unit; eugenic.* Davenport asserts that there can be little doubt of the inheritance of some elements of mechanical skill, and cites illustrative instances. His conclusions are that

(1) When both parents have pronounced mechanical skill, then children will have mechanical aptitude.

(2) If the absence of mechanical skill is an ancestral trait in both parents, none of their offspring will have mechanical aptitude.

(3) If one parent has mechanical aptitude and the other has none and comes from parents similarly deficient, the manifestation of mechanical aptitude in the progeny will be rare.

(4) If one parent has mechanical skill, and the other has not, but comes from parents that have, the progeny will tend to have it in large proportion.

(5) When both parents have slight mechanical skill, but one of them is descended from parents who possessed such skill, the progeny will show such aptitude in the proportion of 1 to 3.

MENTALITY—*Character unit.* Mental ability, or capacity or aptitude, is recognized as a transmissible trait. Mental ability is always relative to the age of the subject and to the average of mentality for that age. This element of relativity necessarily enters into any estimate of mentality as an hereditary factor in any given case. The following are confirmed generalizations, *viz.:*

(1) *When both parents are mentally defective, all their children are mentally defective.* (Degeneracy.)

(2) *When both parents are mentally strong, but have a strain of ancestral weakness, one-fourth of the offspring will be defective.*

(3) *When both parents are mentally strong and are themselves the offspring of mentally strong parents, all children will range from medium to very high mentality.*

(4) *Exceptional talents (genius) occurring in a generation of mediocrity with mediocre antecedents is generally associated with some compensatory mental defect.*

(5) *Exceptional talents (genius) and a certain type of feeble-mindedness ("Mongolianism") occur more frequently in eldest and youngest than in intermediate children.*

The application of these generalizations is of extreme importance to society. The certainty that feeble-minded parents with feeble-minded antecedents will have feeble-minded children emphasizes the social enormity of permitting them to marry. Society obviously has the moral right to protect itself against not only the multiplication of the burden, but in arresting the course of degenerated and degenerative germplasm through succeeding generations. When feeble-mindedness is known to exist in either or both parties to a contemplated marriage, it is the duty of parents, relatives or friends, but particularly the duty of the state to prevent

such contaminating alliance. The influence of grandparental feeble-mindedness in the development of the same condition in the second generation (25 per cent.) shows the importance of a careful eugenic inquiry before the fatal step of "falling in love" has been taken. The notorious failure of geniuses as marital mates finds adequate explanation in the law (4 and 5) as given, and emphasizes the impolicy of bringing unbalanced persons of great talents into relationships that are liable to result in marriage.

MEMORY—*Character unit; eugenic.* The hereditary quality of memory seems to be based upon adequate evidence. It would seem that

(1) When both parents have good or exceptional memory, the progeny, on the average, will have medium or exceptional memory.

(2) When both parents have inherited poor memories, then progeny, on the average, will have poor memories.

(3) When one parent has poor memory and the other has good memory, the progeny, on the average, will have medium memory.

(4) When both parents have medium or poor memory, the resulting progeny will tend to 75 per cent. poor memory and 25 per cent. excellent memory.

MUMPS (*Parotiditis*)—*infectious disease; agenic.* This disease generally occurs in childhood, although it attacks persons of any age and of both

sexes. It is very liable to be epidemic in large schools and industrial establishments. It starts with fever and with pain just below the ears, aggravated by attempts to open the mouth widely and by eating acids. The swelling in the parotid gland generally increases for 3 or 4 days, remains stationary for a similar period, then declines. This typical form of the disease is without genetic significance. In many cases, however, the infection invades the testicles of the male, and the ovaries and breasts of the female by the process known as *metastesis*. It may occur in one or both of these duplex organs. When it occurs in the testicles, these organs become inflamed (orchitis), hot, swollen and painful, these symptoms subsiding after from 7 to 10 days. The testicles thus infected now shrink (atrophy) and the germplasm loses its power to form germ cells (spermatozoa). This means that the patient has become sterile to the extent that the germplasm has been destroyed. In the female, metastesis to the ovaries results in inflammation of those organs (ovaritis). An exudate or false membrane forms over the surfaces of the ovaries, often producing adhesions and always preventing, first, the rupture of the Graäfian follicles, and, next, the consequent escape of the ovule or egg. In this way, the disease makes women sterile. When it attacks the breasts, (mastitis), it causes loss of power to secrete milk. People who have had either double orchitis or double ovaritis from this cause, should look upon themselves as sterile and the fact should be made

definitely understood in connection with any proposal for marriage. To conceal such a fact when known is a fraud and should invalidate the resulting marital contract. In all cases of doubt in the male, the possibility of sterility should be settled by microscopic examination of the seminal discharge to determine the presence or absence of viable spermatozoa. Such an examination should be made only by a person technically qualified to ascertain the truth. There are no means short of surgical exploration to determine the exact condition of the ovaries and Fallopian tubes. (See "Law of Sexual Efficiency;" also, "Gonorrhoea in Women.")

MUSIC—*Aptitude for; character unit; eugenic.* The accepted generalizations with respect to the inheritance of this trait are as follows:

(1) "When both parents are exceptionally good in music (whether vocal or instrumental), all the children are medium or exceptionally good in music."

(2) When both lines of ancestors are non-musical, the progeny will be non-musical.

(3) When one parent has high aptitude for music and the other has little or none, the progeny will show marked variation in this inheritance.

MYOPIA—*Ocular defect; hereditary; genetic.* This a condition of nearsightedness, caused by the shape of the eyeball and of some of its internal structures. The terms of its hereditary transmission

have not yet been finally defined. From the pedigrees so far studied, it would seem that the defect is sex-limited, *e. g.*, the normal wife of a myopic husband may have some myopic sons, but no myopic daughters, in whom, however, the trait becomes transmitted to sons, but not to daughters.

NARCOTISM—*Degeneration index; agenic.* The term is ordinarily used to imply all forms of drug habituation, including alcoholism. This arises from the fact that these various forms of habituation are often alternative or complementary. The patient that gives up opium, for example, drifts to cocaine or to alcohol. It would seem, therefore, that these various appetites have, at the bottom, such an intimate relationship that they become really one expression of an underlying degeneracy. This degeneracy may and generally does inhere in the nervous system, although it is not infrequently associated with lowered general physical type. If narcotism develops in early life, the subject is generally sterile, due to increasing sexual inefficiency. (See "Sexual Efficiency.") Narcotism, as such, is not hereditary, although the degeneracy upon which it depends may be transmitted to offspring in whom it may become manifested as "epilepsy," "insanity," or any of the "neuropathic taints" (*q. v.*). Marriage with a subject of narcotism is inadvisable and should be interdicted by law. Marriage with the offspring of narcotic parents should be advised

only after it has been proven by careful eugenic analysis that the underlying parental degeneracy is at least not dominant in the case. (See "Alcoholism.")

NEUROPATHIC COMPLEX—*Organic nervous defect, agenic.* This condition may be manifested either (a) by abnormally low resistence or (b) actual disease of the nervous system. Its forms are multitudinous.

OVARIES—*Inflammation of.* (See "Mumps" and "Gonorrhoea in Women.")

OVARIES—*Malformations of.* (See "Malformations" also "Mumps.")

PAROTIDITIS—(See "Mumps.")

PAUPERISM—*Degeneration index; agenic.* The social status implied by the word pauperism is generally the result of numerous factors, any one or several of which may be recognized as character units. The complex thus formed is to be recognized as an aggregate result of certain nerve-and-brain degeneracy which may or may not be associated with general physical deterioration. A character unit most generally absent is that of bodily "energy" (*q. v.*). The hereditary transmission of "pauperism" is to be traced through the laws applying to its constituent factors, *e. g.*, "alcoholism," "crimin-

ality," "epilepsy," etc., to which reference should be made. The taint of pauperism, even if erratic in its manifestation, is persistent and should be avoided in marriage.

PSYCHOPATHIC COMPLEX—This is a temperamental type, generally characterized by great mental activity, with a tendency to slight mental perturbation. It is generally associated with the so-called nervous type. (See "Neuropathic Complex.")

(1) When both parents are psychopathic, all the progeny will tend to be psychopathic with manifestations of insanity.

(2) When one parent is psychopathic and the other is not, the resulting progeny will tend to be 50 per cent. psychopathic and 50 per cent. normal with occasional manifestations of exceptional mentality.

The marriage of normals to psychopathics is hazardous. The marriage of two psychopathics to each other ought never to occur.

RACHITIS—(See "Malformations of the Bones.")

SEX—Sex is determined in the germplasm at the time of fertilization. The laws governing the determination of sex in the germplasm are unknown. There are, therefore, no known means by which, in any given instance, sex can be either foretold or forecontrolled before or at the time of fertilization.

The Law of Probabilities as applied to sex production is males to females as 3.9 to 3.7 in the United States and 2 to 2.1 in Great Britain.

SKIN—*Color of; character unit; pigmented, eugenic; non-pigmented* (*albino*), *agenic.* The color of the skin is due to the presence of both granular bodies and more or less diffused pigment in the deeper layer of the integument. In the white race, the color of the skin may normally vary from blond to brunette with varying intermediate shades, each dependent upon the amount of color granules and diffused pigment in the second or subepithelial layer of the skin.

Law of Inheritance of Skin Color in the White Race.

(1) When both parents are pure blonds, their offspring will be pure blonds. (Exceptions less than 7 per cent.)

(2) When one parent is blond and one is darker, 50 per cent. of offspring on the average, will be blond and 50 per cent. of darker type, but rarely darker than the darker parent.

(3) When both parents are dark, the percentage of brunettes varies from 25 per cent. to zero.

(4) Whatever may be the skin color of parents, none of the children will, in general, be darker than the darker parent.

Law of Inheritance in Albinism.

Albinism is an anomalous condition in which there is no pigment in either the skin, hair or eyes.

(1) When both parents are pure albinos, all offspring will be albinos.

(2) When one parent is an albino and the other is pigmented and derived from a thoroughly pigmented strain, the children are all pigmented.

(3) "Whenever albinos occur from two normals, the proportion of these albinos approaches the ideal and expected condition of 25 per cent." (Davenport).

Law of Inheritance of Skin Color in Miscegenation.

The color of the skin is the constant characteristic of the races. The white race (Caucasion), the black race (Negro), the yellow race (the Asiatic), and the brown race (the Malay), are each persistently characterized by standardized pigmentation of the skin.

(1) The skin color of one pigmented parent tends to modify that of the other pigmented parent.

(2) When one parent is white and the other black, the offspring are of the intermediate shade.

(3) When one parent is white and the other a mulatto, the character unit tends to segregate into lighter and darker progeny, but the average pig-

mentation of the progeny is less than the aggregate pigmentation of the mulatto parent.

(4) When both parents are mulattoes, the offspring vary in color from about 50 per cent. to as low as 6 per cent. black in the skin, the aggregate proportion of black in the skin of the progeny being relative to the aggregate proportion of black in the skin of the parents.

(5) The tendency of skin coloration, when the result of miscegenation, is to breed back to the original races, the aggregate dark pigmentation of the last progeny, however, remaining relative to the aggregate dark pigmentation represented in the latest parentage.

STATURE—*Adult; character unit; normal, eugenic; extreme, agenic.* Standing height depends upon the development of the long bones; sitting height depends upon the development of the vertebral column and the cranium. Standing height and sitting height may vary relatively in different individuals. The mean stature of men is 1.08 per cent. greater than the mean stature of women (Galton). The mean male stature in the United States is 69 inches; that of females 64 inches (Davenport).

(1) When both parents are tall, all the progeny tend to be tall.

(2) When both parents are short, the progeny will tend to shortness and tallness, ranging from

50 to 66 2-3 per cent. short to from 50 to as low as 33 1-3 per cent. tall.

(3) When all grandparents are short, their grandchildren tend to be 2 short to 1 tall.

(4) The stature of a given generation tends to approximate the stature of its second preceding (grandparental) generation.

STRENGTH—*General physical.* Character unit, terms of transmission not defined.

SYPHILIS—(See chapter on "Race Poisons.")

TELANGIECTASIS—A disease of the vaso-motor nervous system, characterized by the development of red spots which may become the sources of hemorrhage. Certain observations have been made tending to show that this recognized disease is hereditary, but the facts so far recorded are not conclusive. When it occurs as an apparently dominant trait in otherwise healthy individuals, outbreeding with healthy persons not having the trait will probably result in its eradication in the next generation. (See "Nosebleed" and "Hemophilia.")

TEMPERAMENT—*Character unit; genetic.* Temperament is that permanent condition of the individual that determines his manner of thought and action. The nervous temperament is characterized by keen perceptions, quick mental processes and physical alertness, each tending to develop to an abnormal degree, in which buoyancy alternates with

depression of spirits. The phlegmatic temperament is characterized by slower although not less accurate perceptions, more deliberate and probably more logical mental processes and without precipitate physical activity, and with little or no tendency to either exaltation or depression of spirits. Between these two generally recognized types of temperament are many variations.

Law of the Transmission of Temperament.

(1) When both parents are nervous, the children are nervous.

(2) When both parents are phlegmatic, the children tend to the phlegmatic type.

(3) When one parent is phlegmatic and one nervous, the children will be preponderatingly nervous, the remainder being indeterminate.

(4) When both parents are nervous with phlegmatic ancestry, probably 25 per cent. of the children will be phlegmatic.

The extremes of temperament are agenic in tendency and marriage is not desirable.

TUBERCULOSIS—*Infectious disease; agenic.* This disease is caused by a germ called the *bacillus tuberculosis.* It is most generally but not always introduced into the system through the lungs or upper respiratory channels, and becomes active in structures that do not possess sufficient powers of resistance to overcome its influence. The infection is not hereditary, from which it follows that tuber-

culosis, as such, is not hereditary, but it is equally true that *a low physical type of organization with relatively no power to resist the infection may be hereditary.* The "tuberculous type" is simply a non-resistent type that offers a fertile soil for any infection and the "tuberculous type," in this sense, may be transmitted. While this is true, it must be remembered that tuberculous infection may and not infrequently does invade those of robust physique whose powers of resistance are for the time being below their normal standard. It follows, therefore, that, in determining the possible influence of tuberculous ancestry in a given individual or in a prospective progeny, the question of physical type is the most important for consideration.

Tuberculous subjects ought not to marry while there are any manifestations of the disease present, nor for three years following the disappearance of the last symptom.

The influence of marriage on a tuberculous working man is deleterious, by imposing upon him additional burdens and anxieties; by subjecting him to the sexual obligations of marital life; by making it necessary as a rule for him to live in less sanitary habitations; by lessening his power to obtain food and other necessities of life, all of which tend to lower his vitality and consequently still further to diminish his power to resist the disease. The same considerations apply with equal force, although in possibly different terms, to tuberculous women.

TUMORS—*Of the* (*a*) *uterus, and* (*b*) *ovaries; new growths; agenic.* (a) *Tumors of the uterus* are of two kinds, *viz.:* mucous and fibroid. The mucous tumors grow on the inside of the uterus, to which they are generally attached by a more or less slender neck (polypi), They cause hemorrhage which may become severe. They are agenic, first, because they usually so obstruct the uterus that conception cannot take place, or, if it does take place, in spite of the presence of one of these growths, the latter generally causes early abortion. Fibroid tumors may grow inside the uterus, within the wall itself, or on the outside of the wall of the uterus. They are agenic because, when inside the uterus, they, like mucous polypi, cause hemorrhage and mechanically prevent conception. When they are inside the uterus, or within the wall, they tend to cause abortion in the rare cases in which conception has taken place. When conception has gone to term, these tumors when large, whatever their location in the uterus, tend to interfere with normal delivery. I have twice been compelled to deliver the child surgically through the abdominal wall (Cæsarean section), because of the presence of fibroids—both children and mothers living.

(b) *Ovarian tumors* may not interfere with either conception or parturition. Their agenic quality consists in a tendency, *in certain cases,* to provoke abortion in a certain limited number of cases and in their tendency to rupture during parturition, thus endangering the life of the mother.

In the presence of uterine and ovarian tumors, marriage should be advised against until after surgical removal of the growths. If marriage is insisted upon by the parties themselves, the eugenic consultant should advise them of the exact facts and their possible consequences. The following generalizations are justified by the facts:

(1) A mucous polypus may be removed without impairment of the reproductive function.

(2) A fibroid polypus may be removed without impairment of the reproductive function.

(3) A fibroid tumor involving the wall of the uterus and necessitating the removal of the uterus itself is completely destructive of the reproductive function.

(4) When pregnancy is completed in the presence of a fibroid tumor that prevents natural delivery, the child may be delivered by Cæsarean section.

(5) A fibroid of the uterine wall that can be removed without removal of the uterus need not necessarily destroy the reproductive function.

(6) The removal of an ovarian tumor from one side, leaving a healthy ovary on the other side, reduces the reproductive probabilities by 50 per cent.

(7) The removal of an ovarian tumor from each side, involving the removal of both ovaries, destroys the power of reproduction.

Note:—In each of these instances, it should be remembered that it is not the operation, but the condition that precedes the operation and renders it necessary that either reduces or destroys the power of reproduction.

TWINS—Lucas,[1] after the study of several cases, concluded that the liability to the production of twins could be shown to be hereditary. The causes of transmission are not yet definable.

URETHRA—*Malformations of.* (See "Malformations.")

UTERUS—*Infantile; malformation; agenic.* The uterus is sometimes rudimentary. When it measures 1¾ inches or less in internal longitudinal diameter, it is known as "infantile." After marriage, such a uterus sometimes develops, but never to the normal standard. The condition is associated with either the absence of menstruation or painful menstruation, making the victim a chronic invalid. Marriage may occur with safety, but should always be with the full understanding that reproduction cannot occur. (See "Malformations.")

UTERUS—(*Bifid*); *malformation; agenic* This consists of a partition in the uterine cavity. It is agenic because it tends to lessen the probabilities of conception, although, should conception take place, it offers no particular barrier to parturition.

[1] London Med. Press and Circ., (1911), p. 631.

The condition is but rarely discovered before delivery and is even then generally overlooked.

UTERUS—*Laceration of; injury; agenic.* This condition generally consists of a tear of the neck of the uterus at the time of parturition. In the majority of instances, it is agenic by so distorting the orifice of the uterus as to prevent impregnation; in other cases, it seems to favor conception by widening the mouth of the uterus; in others, it tends to abortion. As the long continuance of these lacerations tends to cancer of the uterus—another agenic factor—they ought always to be repaired.

UTERUS—*Inflammation of; disease; agenic.* Inflammation of the lining membrane of the uterus is agenic, because it interferes with impregnation, or when impregnation does take place, it tends to abortion. The condition ought always to be overcome before marriage. (See "Uterus—Infections of," also, "Gonorrhoea in Women.")

UTERUS—*Infections of; agenic.* Infections of the uterus are due to the presence of various micro-organisms or germs within its cavity, or within its walls. These germs cause inflammation which may become chronic, but whether acute or chronic, tend to interfere with reproduction. (See "Gonorrhoea in Women," "Syphilis in Women," "Tuberculosis," "Puerperal Fever.")

VAGINA—*Malformations of.* (See "Malformations.")

VULVA—*Malformations of.* (See "Malformations.")

WEIGHT—(*Adult*); *normal, eugenic; extremes, agenic.* The mean weight of fathers is about 162 pounds; that of mothers about 131 pounds (Davenport). Weight varies relatively to height and circumference.

Normal Proportion of Weight to Height.

HEIGHT	MALE	FEMALE	HEIGHT	MALE	FEMALE.
60 in.	131 lbs.	112 lbs.	68 in.	157 lbs.	144 lbs.
61 in.	132 lbs.	117 lbs.	69 in.	162 lbs.	150 lbs.
62 in.	134 lbs.	122 lbs.	70 in.	167 lbs.	155 lbs.
63 in.	137 lbs.	126 lbs.	71 in.	172 lbs.	160 lbs.
64 in.	140 lbs.	131 lbs.	72 in.	177 lbs.	165 lbs.
65 in.	143 lbs.	136 lbs.	73 in.	182 lbs.	170 lbs.
66 in.	147 lbs.	139 lbs.	74 in.	190 lbs.	
67 in.	152 lbs.	141 lbs.	75 in.	198 lbs.	

The rules governing the transmission of weight seem to be:

(1) When both parents are heavy and have had heavy parents, their offspring will tend to be heavy.

(2) When both parents are light and had light parents, their offspring will tend to be of light weight.

(3) When both parents are heavy irrespective of grandparents, the light children are practically equal to the heavy children (Davenport).

CHAPTER XIV.

Conclusions.

A review of the subject matter of the preceding pages forces several important conclusions, careful observation of which, in practical life, will tend to the increasing happiness of many individuals and to the betterment of the race.

(1) The more or less instinctive selection in marriage, now too much in vogue, should yield to a more intelligent choice of mates for the perpetuation of the human family. This more intelligent choice should be made, not by supplanting the affections by science, but by fortifying the hallowed sentiment of love with intelligence based upon ample human experience. The appeal to love should be broader and deeper and should be based quite as much, if not more, upon those qualities, hidden or obvious, which have been bred into the individual, than upon mere beauty, culture or wealth. Love, from a date even preceding as well as during the association leading to marriage, should embrace a consideration of the welfare and happiness of the innocent unborn, who ought thus, as far as possible, to be safeguarded in advance against the perils of existence.

(2) The science by which this end is being accomplished in many individual instances, the science of eugenics, is precisely the same science by which

the farmer has improved his grain, the grower his fruit, the breeder his stock and the fancier his broods and litters. It is a science which, while still in its early and developmental period as applied to the human family, is yet founded upon the fundamental laws not only of human life, but of life in every phase of its manifestation.

The fundamental conception underlying the science of eugenics is that life is not only universal, but continuous from generation to generation. The continuity of human life, its perpetuation from generation to generation, is effected through the germplasm which exists as the same germplasm in parents and offspring, and which exists with, but is different from the body plasm. This perpetuation of human life, this passing on of the human germplasm from generation to generation is accomplished by the function of sex and in conformity to the laws governing sexual efficiency.

(3) But the germplasm, thus continuous from generation to generation, is the medium for the perpetuation not only of the mere attributes of organic life, but the attributes of the race and of the individual. These attributes, called character units, derived from two parents, do not blend and in that way modify each other, but, in conformity to the law of variations, a character unit derived from one parent dominates over an antagonistic character unit derived from the other parent. It should be remembered, however, that the character unit thus dominated is not lost in the individual

offspring, in whom it may simply remain inactive or recessive, to become active or dominant, under favoring circumstances in a later progeny. It is in the discovery and clear definition of individual character units and in the practical application of the law of variation that exists the possibility of human improvement by selective breeding.

(4) It is by the operation of the laws just outlined that children inherit traits from their parents. This process has been and is yet too generally recognized as merely fortuitous, something that just happens without reference to the great overriding law of cause and effect. It is now known, however, that the great process of human reproduction is not something outside of orderly control, but that in every instance, good or bad, it is the very highest, because it is the most complex manifestation of the operation of natural law. In other words, it is now known that, given the definite factors in each parental strain, the characteristics of any resulting progeny can be predicted with approximate accuracy.

(5) While the continuity of life is effected through the persistence of the germplasm, the transmission of character units is effected in conformity with the laws of heredity. This law, discovered by Mendel and apparently universal in its application, is one to which practical conformity is made difficult because of the difficulty, if not impossibility, of determining all the hereditary factors as they exist in the individual parents. The

process of hybridization, of haphazard "scrub breeding," has gone on in the human family so long that pure strains with definite character units are practically unknown. This fact simply imposes upon parents and teachers the obligation to instil into the minds of their children and pupils—the potential parents of the next generation—the extreme importance of recognizing the best germinal inheritance as the best and sanest appeal to the sentiment of love.

(6) In breeding for general excellence, the very highest form of human breeding, it should be remembered that there is an inherent tendency in the human family to approximate an average standard. It is in conformity to this law of the human norm that the progeny of the less favorably endowed have a tendency to advance in human efficiency while the offspring of stronger parents so generally fall back to the average standard. Genius has often sprung from the loins of mediocrity, but mediocrity has even oftener sprung from the loins of genius. It thus occurs that regression and progression are equally phenomena of human breeding.

(7) Heredity, with the tendency to approach the mean average of the race, imposes upon individuals the obligation carefully to avoid the transmission of deteriorating regressive or agenic traits and to cultivate the transmission of progressive or eugenic traits. In no other way can the mean average of the race be elevated in its germinal characteristics. These germinal characteristics, it should be

remembered, are fortunately susceptible of important modification, such as repression or development, by the influence of environment—a subject entirely outside the purpose of this book, but to which I shall devote a separate volume. It is here pertinent to say that a competent knowledge of genetic factors, especially of hereditary units, as manifested in the pupil, will give to intelligent parents and enlightened teachers a definite problem with the key to its national solution.

(8) But all genetic factors are not embraced in the category of hereditary traits. Any condition or influence that may in any way modify the reproductive power or determine either the number or quality of offspring, or in any way interfere with the function of parenthood is to be regarded as a genetic factor. While the majority of these factors relate to the question of sexual efficiency, some of them, notably gonorrhoea, syphilis, alcohol and the narcotics are to be recognized as such deteriorants of the human family that they have been aptly designated by Saleeby as "race poisons."

(9) The practical application of eugenic laws to the betterment of the human race, while made possible by enlightened human love and wholesome social convention, is an important attribute of medical science. In other words, while eugenics appeals to the loftiest sentiments of civilization, it is nevertheless a science that deals deliberately and unemotionally with the very fundamental conditions, the most powerful impulses, the most potent forces

in the determination of human happiness and human welfare. Its safe practical application must, therefore, imply a certain technical training which can be found only in the medical profession. It is obvious, therefore, that, by careful and scientific medical examination alone, can the interests of prospective parties to the marital union and the welfare of their probable progeny be safeguarded against disease and degeneracy.

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